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# SOLID WASTE HANDLING AND DISPOSAL IN MULTISTORY BUILDINGS AND HOSPITALS. VOLUME II. OBSERVATIONS OF LOCAL PRACTICE

ESCO/GREENLEAF

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# SOLID WASTE HANDLING AND DISPOSAL IN MULTISTORY BUILDINGS AND HOSPITALS

## VOLUME II Observations of Local Practices

*This final report (SW-34d.2) on work performed under solid waste management demonstration grant no. EC-00164 to the County of Los Angeles was written by* ESCO/GREENLEAF *and is reproduced as received from the grantee.*

| | |
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| VOLUMES I and III | *Summary, Conclusions, and Recommendations* (SW-34d.1) and *Research on Systems Development* (SW-34d.3) are available from the U.S. Government Printing Office, Washington, D.C. |
| VOLUME IV | *Selection and Design of Solid Waste Systems* (SW-34d.4) is available under separate cover from the Department of Commerce, National Technical Information Service, Springfield, Virginia. |

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U.S. ENVIRONMENTAL PROTECTION AGENCY

1972

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An environmental protection publication in the solid waste management series (SW-34d.2).

This report has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of commercial products constitute endorsement or recommendation for use by the U.S. Government.

# FOREWORD

In the past century of national growth, reflected in increased population, expanding municipalities, and greater industrial and commercial enterprises, this Nation responded with nonconcern to a concurrent physical deterioration of the country. The first comprehensive water pollution control legislation was not enacted until 1956; the first comprehensive air pollution legislation, in 1963. Finally, six years ago, legislation acknowledged a national solid waste problem--a pollution that can pervade the air, water, and land.

Under the Solid Waste Disposal Act of 1965 (Title II, P.L. 89-272) and now under the broader mandate of the Resource Recovery Act of 1970 (P.L. 91-512), municipalities and other agencies are eligible to apply for Federal demonstration grants to study, test, and demonstrate techniques which advance the state of the art in the solid waste management field.

Disquieting statistics compiled by the U.S. Environmental Protection Agency point up the significance of these solid waste management demonstration projects. The Nation's outlay for getting rid of its debris is $4.5 billion annually--and growing. Most of this cost is: (1) for collecting only part (180 million tons) of the 360 million tons of household, commercial, and industrial waste actually being generated; (2) for disposing of it in dumps or landfills (94 percent of which are unsatisfactory) or in incinerators (75 percent of which are inadequate). One basic Federal policy has been to encourage the concept of areawide solid waste management as a sound vehicle for raising the overall level of these sanitation services to safeguard environment and public comfort.

The County of Los Angeles received one of these demonstration grants, to make an in-depth study of solid waste handling and disposal in multistory buildings and hospitals. The results are reported herein.*

--SAMUEL HALE, JR.
*Deputy Assistant Administrator*
*for Solid Waste Management Programs*

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*For studies also related to collection and disposal of solid wastes in high-rise buildings, refer to National Academy of Sciences--National Research Council. Collection, reduction, and disposal of solid waste in high-rise multifamily dwellings. Rockville, Md., U.S. Environmental Protection Agency, 1971. [Distributed by National Technical Information Service, Springfield, Va., as PB 198 623. 169 p.]

# ACKNOWLEDGMENT

The ultimate purpose of this study is to determine improved solid waste handling and disposal techniques adaptable to various types of multistory buildings, hospitals and detention facilities. This research initiated by the Project Planning and Pollution Control Division, Department of County Engineer, County of Los Angeles, was performed with the assistance of the Solid Wastes Program, National Center for Urban and Industrial Health, U.S. Public Health Service, Department of Health, Education, and Welfare,* and through guidance of the Advisory Committee on Solid Wastes, organized by the Department of County Engineer to assist the project team throughout the study period.

ESCO-GREENLEAF, A Joint Venture (Engineering Service Corporation, Los Angeles, California, and Greenleaf/Telesca, Engineers & Architects, Miami, Florida) was selected by the Board of Supervisors to conduct this study in collaboration with the Project Planning and Pollution Control Division. Special consultants assisting the project staff in certain aspects of the study include Elmer R. Kaiser, Senior Research Scientist, New York University; George S. Michaelsen, Professor and Director, Division of Environmental Health and Safety, University of Minnesota; Richard G. Bond, Professor, School of Public Health, University of Minnesota; Donald Vesley, Assistant Professor, School of Public Health, University of Minnesota; and Gordon P. Larson, Air Pollution Control Consultant, Philadelphis, Pennsylvania.

Considerable interest in this study has been shown by many governmental agencies, equipment manufacturers and individuals directly concerned with the subject. With this encouragement, together with the direct and indirect assistance of numerous contributors, enthusiasm for successful completion of the study has been maintained.

Sincere appreciation is extended to the administrators and staffs of all hospitals, members of the Sheriff's Department and representatives of the Department of Building Services, who cooperated and assisted in the on-site investigations in those buildings under their respective jurisdictions.

The constructive criticism and guidance of members of the Advisory Committee on Solid Wastes were invaluable and special recognition for the member agencies is warranted. Agencies represented in this Committee include: Los Angeles County, Hospital Department, Mechanical Department, Building Services, Health Department, Forester and Fire Warden, Department of County Engineer, and Air Pollution Control District; and the State of California, Department of Public Health and Regional Water Quality Control Board.

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*Now the Office of Solid Waste Management Programs, U.S. Environmental Protection Agency.

# PREFACE

Problems of solid waste collection and disposal in institutions and other multistory buildings mirror many of the same problems confronting the community at large--in greatly magnified form. In large building complexes, as in many of the Nation's communities, solid waste systems often are so crude as to be termed, in the words of this report, "manhandling." Either in large buildings, the subject here, or in a community, a two-prong approach will be necessary--immediate application of improved methods that are presently available, and then planning and research for optimal future solutions.

This study, supported in part by solid waste management demonstration grant no. GO6-EC-00164 from the Environmental Protection Agency, reflects this approach, and hopefully will motivate administrators and designers concerned with multistory complexes to consider solid waste handling and disposal as an integral factor in the total service system provided for these buildings. Such a consideration must take into account safety, sanitation, convenience, and cost. The complete study is reported in four volumes:

Volume I, Summary, Conclusions, and Recommendations, presents a digest of study objectives, development of systems evaluation methodology, and criteria for systems design, together with a brief review of the total study. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

Volume II, Observations of Local Practices, is a detailed study and evaluation of systems and practices in fifteen County-owned building complexes, including seven hospitals, four multistory office buildings, and four detention facilities, varying in function and size within each classification. This report establishes the theoretical standards of operation peculiar to each plant and, through field observations, actual operating conditions of these systems. Available from the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22151.

Volume III, Research on Systems Development, covers an investigation and evaluation of available solid waste handling, storage, processing, and disposal equipment and systems adaptable to building installations. This report provides coverage on both marketed systems and equipment components, as well as systems concepts in the development and "idea" stage. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

Volume IV, Selection and Design of Solid Waste Systems, provides an extended evaluation of systems adaptable to the various classifications of buildings and complexes considered in the study, with recommendations for operational improvements or modifications of existing systems as may be required in each type of facility. Design criteria and preliminary design of systems modifications, together with outline specifications and cost estimates covering installation and operation, are developed on a selected building complex. Available from the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22151.

John A. Lambie, County Engineer, County of Los Angeles, was the project director for this study; Peter M. McGarry, with our Division of Demonstration Operations, was the project officer.

--JOHN T. TALTY, *Director*
Division of Demonstration Operations
Office of Solid Waste Management Programs

Page No.

## CONTENTS

I INTRODUCTION I-1

II LAC-USC MEDICAL CENTER II-1

III LONG BEACH GENERAL HOSPITAL III-1

IV HARBOR GENERAL HOSPITAL IV-1

V RANCHO LOS AMIGOS HOSPITAL V-1

VI JOHN WESLEY HOSPITAL VI-1

VII OLIVE VIEW HOSPITAL VII-1

VIII MIRA LOMA COMPLEX VIII-1

IX DETENTION FACILITIES IX-1

X OFFICE BUILDINGS X-1

XI SUMMARY AND CONCLUSIONS XI-1

Volume II as contained herein presents our findings of waste handling, storage, processing and disposal practices in County-owned building complexes as classified and listed below:

**Hospitals:**

LAC-USC Medical Center
Long Beach General
Harbor General
Rancho Los Amigos
John Wesley
Olive View
Mira Loma Hospital

**Detention Facilities:**

Mira Loma Sheriff's Facility
Central Jail
Sybil Brand Institute
San Fernando Juvenile Hall
Hall of Justice

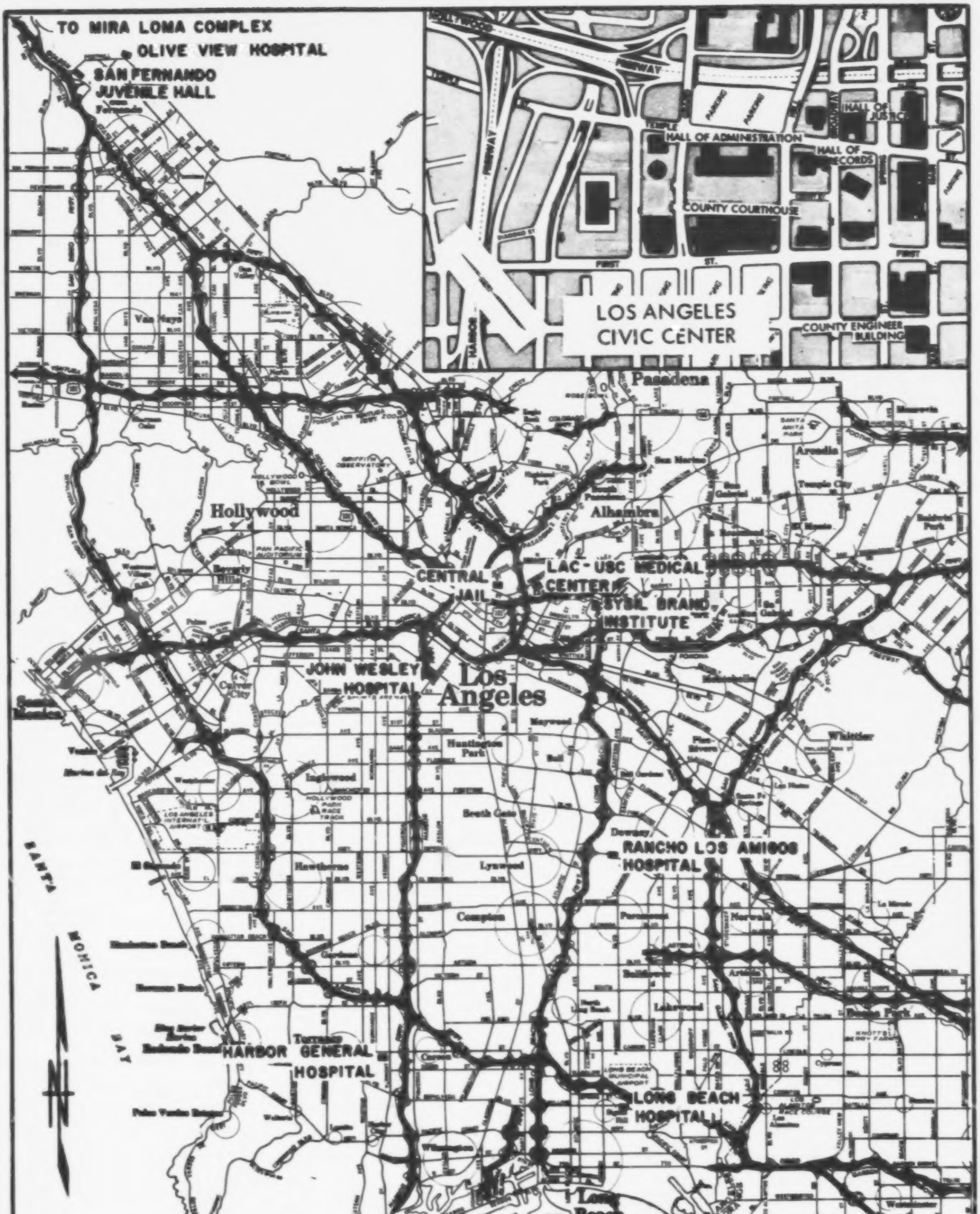
**Office Buildings:**

Hall of Records
Hall of Administration
County Courthouse
County Engineer Building

Figure I-1, the Los Angeles County vicinity map with inset of the Civic Center area, identifies the location of each of the respective facilities with the exception of the Mira Loma Complex located (off the map) in the extreme northern portion of the County.

Method of Study:

Organization of the study of local facilities called for grouping these complexes by building classifications, i.e. hospitals, detention facilities and office buildings, for first inspection. Review of the complexities of the waste handling systems of each suggested the sequence of observations should be made in reverse, i.e. tracing wastes and the handling practices from point of disposal to the point of origin. Further analysis indicated these observations could be accomplished effectively in two separate stages. The first stage to include only the inter-building handling system from the point of intermediate storage within each building through the point of


TO MIRA LOMA COMPLEX
OLIVE VIEW HOSPITAL
SAN FERNANDO JUVENILE HALL
HALL OF JUSTICE
HALL OF ADMINISTRATION
HALL OF RECORDS
COUNTY COURTHOUSE
FIRST ST.
FREEWAY
HARBOR
PARKING
LOS ANGELES CIVIC CENTER
COUNTY ENGINEER BUILDING
Van Nuys
Pasadena
Monrovia
Arcadia
Temple City
San Marino
Alhambra
Hollywood
Beverly Hills
LAC-USC MEDICAL CENTER
CENTRAL JAIL
SYBIL BRAND INSTITUTE
JOHN WESLEY HOSPITAL
Los Angeles
Culver City
Santa Monica
Huntington Park
Maywood
Whittier
Inglewood
South Gate
Downey
RANCHO LOS AMIGOS HOSPITAL
Hawthorne
Lynwood
Compton
Norwalk
Bellflower
Lakewood
Torrance
HARBOR GENERAL HOSPITAL
LONG BEACH HOSPITAL
Wilmington
Long Beach
SANTA MONICA BAY
N

Vicinity Map

FIGURE I-1

disposal or central storage and the final stage to include the in-building and floor handling of waste from the point of intermediate storage to the point of origin.

Initial observations of the waste systems generally common to all building classifications included determination of in-plant regulations, types of waste generated, frequency of collection, location of storage and disposal points, and transport routes, equipment used and manpower requirements. With this basic data, a schematic plan of the inter-building system was prepared and detailed studies of the system operation commenced. It was indicated that first observations, including records of daily quantities and types of refuse generated, together with the observer's comments on storage and handling practices (documented by pertinent photographic coverage), would be essential in defining the magnitude of the problem and specific problem areas in each waste system.

It was also obvious that certain variations could be expected in system requirements between the three building classifications, and required detail in system observations would vary not only with the building classifications but also with the complexity of plant layout and range of services furnished at each facility.

In the case of hospitals, the quantity survey of total wastes produced provided identification of types, including mixed refuse (both combustible and non-combustible that normally would be charged to an incinerator), segregated non-combustibles (glass, cans, etc.), pathological wastes, food wastes (non-grindable) and other visually identifiable wastes that are segregated. This initial survey also identified the points of collection from central or intermediate storage or in some cases by floors, wards, or departments. Summaries of these quantity surveys included the total waste collected at storage points and calculations of daily waste generation factors in pounds per capita, per bed patient and per square foot of building area. The observer's comments supported by photographic coverage where possible illustrated actual conditions of transport, storage, loading, unloading and on-site disposal occurring in the waste handling system. These observations contributed to the evaluation of the adequacy of individual systems from the various aspects of sanitation, safety, security and esthetics.

Continuing observations of the solid waste systems in the hospital complexes covered the in-building handling of materials from the point of intermediate storage to the point of origin. Classification of waste materials for this purpose were generally divided into the two broad categories of Reusable Wastes and Disposable Wastes, with appropriate breakdowns within each classification dependent on variations and operating procedures of each facility.

The principal purpose of this in-building study was to identify handling methods of the various types of waste materials together with determination of quantities of certain disposable and reusable wastes (such as grindable food wastes, food service, etc.) not determined in the earlier field studies. Secondary benefits of these observations provided manhour estimates of various personnel classifications handling waste materials, which was the basis of determining costs of the in-building system.

The foregoing observations also provided the basis for continuing specialized studies on aerosol contamination within selected areas of one of the major hospital plants. These studies presented in Chapter II involved investigation of airborne contaminants and potential surface contamination resulting from solid waste handling practices.

Prevailing methods of off-site disposal of hospital wastes are generally limited to direct haul to landfills, but in some cases via transfer stations to landfills. Final evaluation of the individual systems includes the ultimate disposal of wastes generated at each facility, and is a considered factor in evaluating the total adequacy of each system.

The investigation of solid waste systems in detention facilities and office buildings, though not as complex as the investigation of hospital systems, was of relatively the same scope, including similar field observations as well as the evaluation of the efficiency of the respective systems and analysis of operating costs.

As a result of the total study in Volume II, basic needs are established for upgrading handling and disposal systems of the plants studied. Complete evaluation of system requirements and alternative solutions that may be considered are presented in Volume IV, wherein remedial measures are recommended to improve existing system operations.

In the following presentation of observations of local practices, this volume is subdivided into chapters dealing with each of the facilities or types of facilities studied, providing complete data on system components and operating characteristics, as well as an evaluation on performance capabilities and the cost analysis of each system. Considerable volumes of raw data were assembled during these investigations. Only that data considered necessary to support the initial evaluations is included in each of the project reports. These reports are intended to provide the backup of our findings as summarized in Chapter XI and the concluding evaluations as presented later in Volume IV.

In the following chapter on the LAC-USC Medical Center, considerable detail is presented covering the step-by-step procedures of the observations and evaluations that were typical for each of the project investigations.

In order that the reader be informed on the details involved in the evaluation procedures as well as insight into the total scope of this study, prior review of Volume I is recommended.

VOL. II OBSERVATIONS OF LOCAL PRACTICES

CHAP. II LAC-USC MEDICAL CENTER

Page No.

DESCRIPTION OF EXISTING PLANT II-1
- Range of Medical Functions and Specialties II-1
- Plant Services and Population II-2
- Location, Buildings and Land II-4

CHARACTERISTICS OF THE SOLID WASTE SYSTEM II-7
- Types of Waste Materials Generated II-7
- Brief Description of the Total System II-8
- Responsibility of Solid Waste Management II-9
- Organization of Manpower II-11

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM II-13
- The Inter-Building Materials Handling System II-13
- Handling and Storage of Disposable Waste Materials II-17
- Waste Disposal Practices II-19
- Handling and Storage of Reusable Waste Materials II-20
- Quantities and Types of Disposable Waste Materials II-21
- Quantities and Types of Reusable Waste Materials II-26
- Summary of Total Waste Production II-28
- Equipment and Building Areas Used in System Operation II-28
- Subcontract Services and Disposal Fees II-31
- Personnel Requirements II-31

OBSERVATIONS OF THE IN-BUILDING SYSTEM II-32
- General II-32
- Handling of Disposable Waste Materials II-33
- Handling of Reusable Waste Materials II-34
- Personnel Requirements II-34
- Equipment and Building Area Requirements II-38

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM II-39

OBSERVATIONS ON AEROSOL CONTAMINATION II-46
  Equipment and Procedures Used II-46
  Observations at Selected Sampling Stations II-47
  Results of the Sampling Program II-48

EVALUATION OF EXISTING SYSTEM OPERATION II-50
  The Developed Rating II-52

## LIST OF TABLES

II-1 Shift Population and Waste Production II-3
II-2 General Services Personnel II-12
II-3 Inter-Building Disposable Waste Collection II-22
II-4 Production of Disposable Wastes by Buildings II-23
II-5 Load Record 8-Day Period II-24
II-6 Soiled Linen Processing - October 1968 II-27
II-7 Summary of Daily Waste Production II-29
II-8 Costs of Building and Equipment in Inter-Building and Off-Site System II-30
II-9 Daily Requirements for In-Building Waste Handling II-36
II-10 Labor Requirements of In-Building Waste System II-37
II-11 Building Areas and Equipment of the In-Building System II-38
II-12 Estimated Annual Equipment Operating Cost II-40
II-13 Estimated Daily Labor Costs of Hospital Solid Waste Systems II-41
II-14 Distribution of Estimated Annual Costs to Waste System Components II-43
II-15 Cost Comparison of Disposable and Reusable Wastes II-44
II-16 Summary of Air Sampling Data II-48
II-17 Description of Hospital Solid Waste Systems II-51
II-18 Numerical Rating of Hospital Solid Waste Systems II-53

Page No.

## LIST OF FIGURES

II-1 Site Plan II-5
II-2 Aerial Photograph of LAC-USC Medical Center II-6
II-3 Observations of Daily Cart Movement II-15
II-4 Detail of Clean and Soiled Cart Movements II-16
II-5 Schematic of Inter-Building Solid Waste System II-18
II-6 Air Sampling Procedures in Soiled Linen Room II-48

## DESCRIPTION OF EXISTING PLANT

Los Angeles County-University of Southern California Medical Center, until 1968 known as Los Angeles County General Hospital, is the largest facility of the eight hospitals presently operated by the Los Angeles County Department of Hospitals and one of the largest facilities in the United States. Through its affiliation with USC Medical School, it is also one of the largest teaching hospitals in the country. The Medical Center, along with the other County hospitals, is administered by the Board of Supervisors through the Director of the Department of Hospitals. However, at plant management level, each of these hospital facilities may be considered autonomous or semi-autonomous in the adoption and implementation of administrative policies and plant operating procedures.

### Range of Medical Functions and Specialties:

The Medical Center is operated to provide hospitalization, out-patient care and convalescent care as well as home care for qualifying patients within certain geographic limits of Los Angeles County and the maximum capacity limits of its facilities. It offers specialized diagnostic, medical and surgical procedures as well as emergency care for the critically ill and accident victims. It provides teaching and training programs for medical specialties, nursing and allied health professions, including clinical teaching to USC students and post-graduate training for health personnel through its affiliation with the University, as well as inservice training for both health and supportive personnel. It actively supports research efforts to advance medical knowledge, treatment techniques, health services and management functions, all in cooperation with the University.

Types of care offered include preventive, diagnostic and therapeutic functions. Plant facilities provide for inpatient, outpatient and emergency services. A comprehensive range of medical care specialties, or special categories, are provided including:

- Internal Medicine
- Chest Medicine
- Dermatology
- Metabolic Unit
- Renal
- Dentistry
- Neuromedicine
- Pediatrics
- Communicable Diseases
- Psychiatry
- Jail Medicine
- General Surgery
- Chest Surgery
- Tumor
- Obstetrics/Gynecology
- Burns
- Neurosurgical
- Orthopedics
- Otolaryngology
- Ophthalmology
- Urology
- Premature Center

Plant Services and Population Related to Solid Waste Production:

Present plant services maintained at this facility and staffed by hospital personnel include the Dietary Department, which prepares some 10,000 meals daily, the Laundry, which processes some 56,500 pounds of soiled linen daily with a working staff of 200, General Services (Housekeeping and Custodial Services) with a staff of 600, the Transportation Department, Maintenance Shops, Security, Pharmacy.

The Business Office, Medical Records, Personnel, Communications and the Computer Center provide those business services required in further support of the plant activities. A nursing staff of 1,466 and 3,181 nurses aides (attendants) are involved in the various aspects of patient care functions.

Total population in the Medical Center Complex is comparable to that of a substantial community. Including patients, paid and non-compensated personnel, there is a gross population of approximately 21,000 persons scheduled over a seven-day week, 24-hour day basis. Non-compensated personnel include students, trainees, volunteer workers and personnel that may be paid by other agencies.

The breakdown of the total population based on daily census records and ordinance personnel lists consists of about 2,000 bed patients per day (avg. seven-day basis), 2,800 outpatients per day (avg. five-day basis), 10,800 paid personnel and 5,600 non-compensated personnel.

Each person in this total population of 21,000 is a direct creator of solid waste, and quantities of wastes each generates varies with his classification, daily activities and hours present.

Table II-1 illustrates probable variations in plant population that may occur over the weekly period and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE II-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients (constant) | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Outpatients | 2,800 | --- | --- | --- | --- | --- |
| Paid Personnel | 5,400 | 1,500 | 1,500 | 3,000 | 1,500 | 1,500 |
| Non-Comp. Personnel | 3,200 | 1,600 | 800 | --- | --- | --- |
| Total Est. Population/Shift | 13,400 | 5,100 | 4,300 | 5,000 | 3,500 | 3,500 |
| Avg. Shift & Daily Pop. | *7,100 | | | 4,000 | | |
| Rate of Waste Production: % of Daily Production | 54% | 25% | 21% | 42% | 29% | 29% |

*Includes outpatients weighted at 1/2 value due to limited time in hospital

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

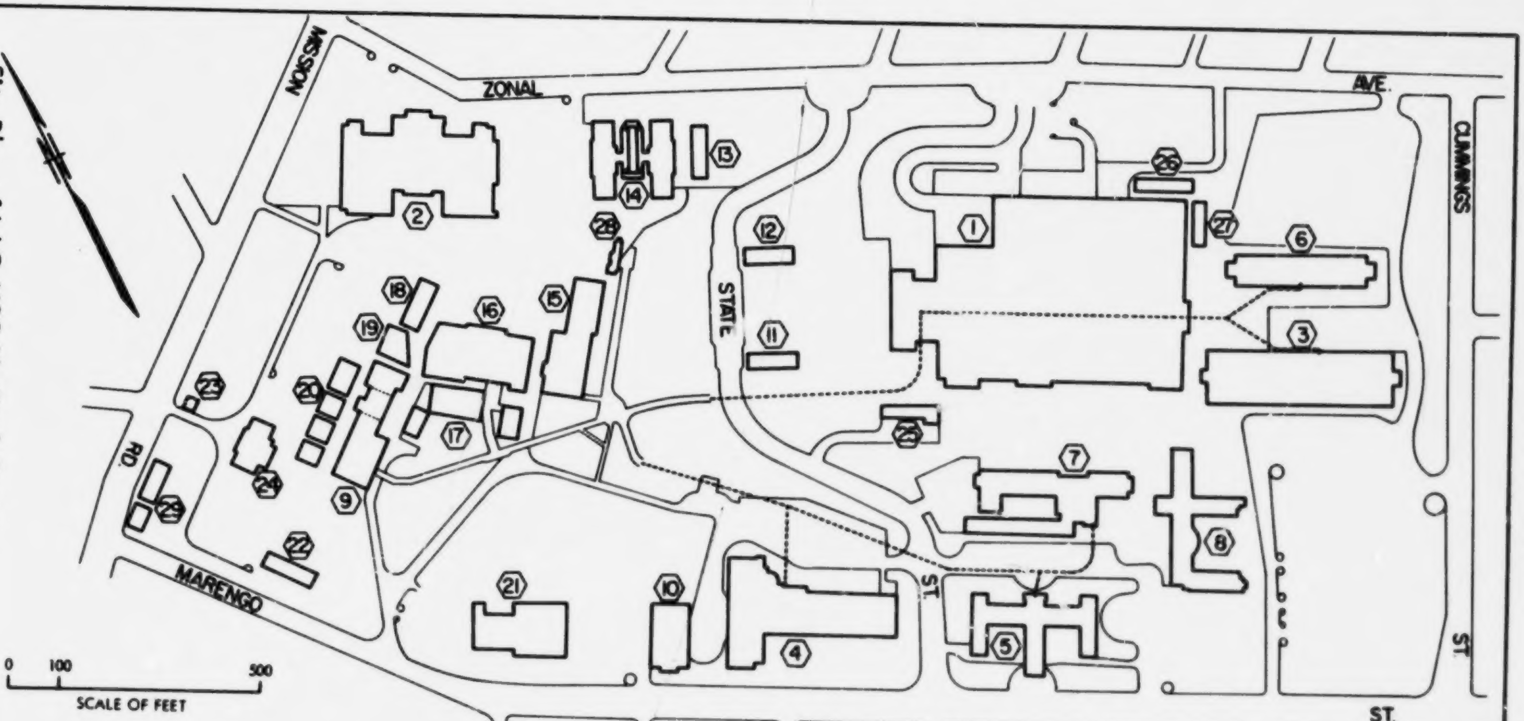
Location, Buildings and Land:

The Medical Center is located in the Central District of Los Angeles about one mile northeast of the downtown Civic Center. Bounded by Mission Street, Marengo Avenue, Cummings Street and Zonal Avenue, it occupies a site of some 68 acres bisected by State Street meandering on a north-south axis through this property. The proportions of the property range from about 1200 feet wide on the north-south axis to an average length of some 2500 feet. Grade differential is considerable, ranging from the highest elevation on the east boundary (Cummings Street) at 430' MSL, falling about 125' in grade to the west with its lowest elevation at about 305' in the southwest portion of the property.

Basically, the total site consists of three building plateaus. Nominal differences in grade will be found in that portion of the property developed as building sites and parking areas lying west of State Street with grades ranging from the low of 305' to 337'. The developed building areas generally lying in the southeast quarter of the property, east of State Street, range from a low of 330' to a high of 350'. In the northeast quarter, also lying east of State Street, grades range from a nominal low of 360' to 400', with abrupt changes of grade occurring along the west and south borders of this parcel.

This complex is comprised of 28 buildings, varying from 1 to 20 stories in height. Nineteen of these buildings are classified as permanent structures. The remaining nine buildings, though classified as obsolete, are currently in use.

The Site Plan of the existing plant, Figure II-1, identifies all buildings by number, function, number of stories, etc. The aerial photograph, Figure II-2, further illustrates the relationship of buildings and emphasizes the magnitude of this complex. Future development by the addition of major new buildings will likely be confined to the general area presently occupied by these obsolete structures. Buildings in this complex, ranging from 5 to 40 years in age, together with land, equipment and vehicles, are estimated to have a replacement value of approximately $150,000,000. Collectively, the existing buildings provide about 3,000,000 square feet of useable floor area, of which some 2,800,000 square feet is represented in permanent structures.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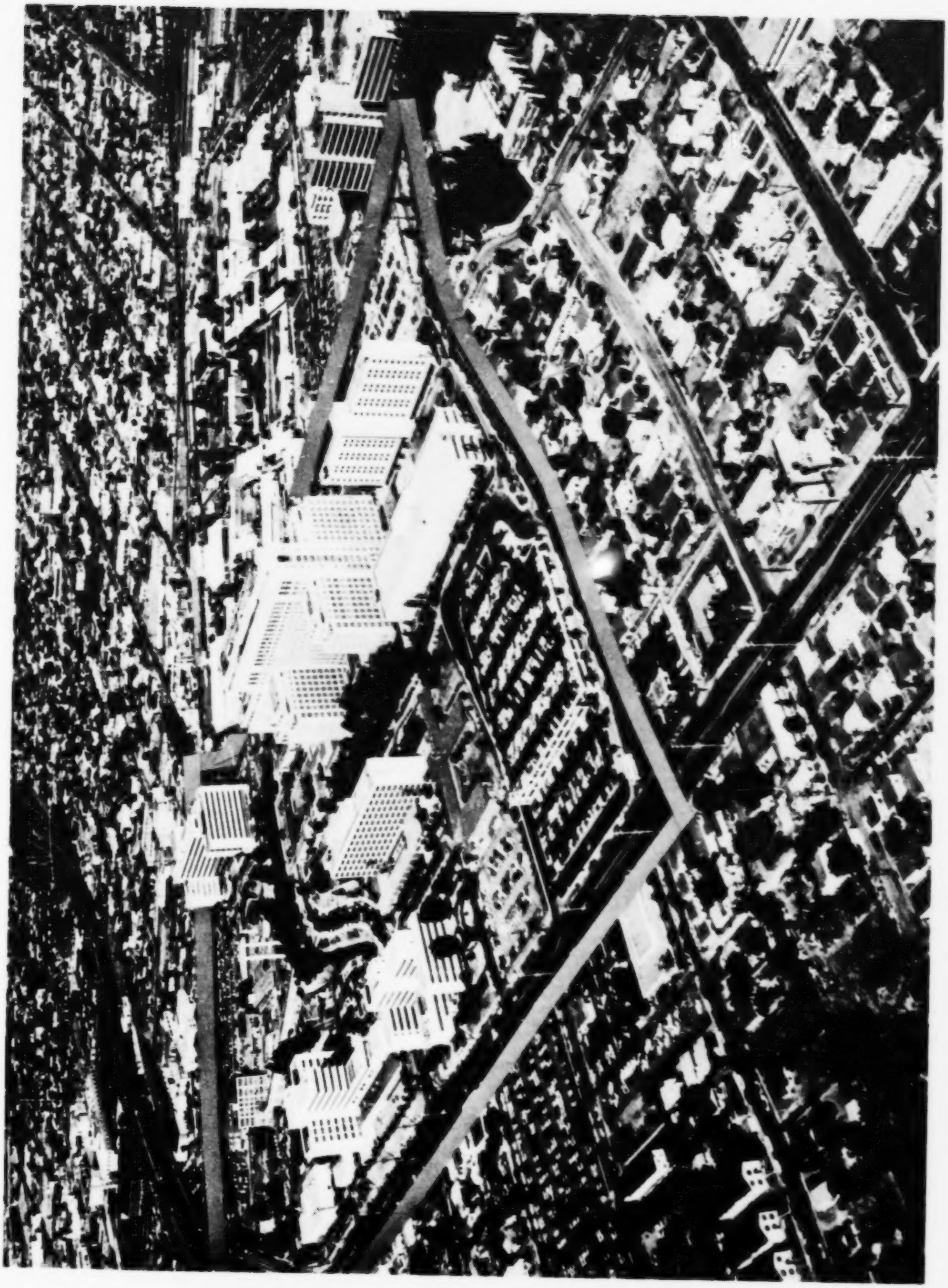
19
20
21
22
23
24
25
26
27
28
29
0
100
500
SCALE OF FEET

BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Unit I - Acute | 19 | 1,285,000 | 9 | Pharmacy | 6 | 55,000 | 16 | Laundry | 2 | 55,200 | 23 | Gate House | 1 | 2,400 |
| 2 | Unit II - O.B. & Gyn. | 9 | 376,110 | 10 | General Laboratory | 3 | 33,000 | 17 | Shops | 1 | 12,200 | 24 | Admin. (Hosp. Dept.) | 4 | 30,600 |
| 3 | Outpatients | 4 | 209,000 | 11 | Chaplain | 1 | 2,750 | 18 | Research Building | 3 | 14,500 | 25 | Telephone Exchange | 2 | 6,180 |
| 4 | Pediatrics & C.D. | 8 | 171,075 | 12 | Patient Identification | 1 | 2,725 | 19 | Garage | 2 | 6,160 | 26 | Storage | 1 | 2,940 |
| 5 | Psychiatric | 9 | 132,000 | 13 | Research Building | 1 | 22,000 | 20 | Storage | 1 | 4,100 | 27 | Storage | 1 | 2,270 |
| 6 | Interns Residence | 10 | 139,000 | 14 | Clinical Research | 4 | 61,000 | 21 | Steam Plant | - | -- | 28 | Incinerator | - | -- |
| 7 | Nurses Res. & Classrooms | 9 | 171,620 | 15 | Power House | - | — | 22 | Cancer Research | 2 | 10,200 | 29 | Classrooms | 1 | 2,000 |
| 8 | Nurses Residence | 2 | 46,000 | | | | | | | | | | | | |

Site Plan of LAC-USC Medical Center

FIGURE II-1



Aerial Photograph of LAC-USC Medical Center

FIGURE II-2

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

The foregoing description of the existing facilities at the Medical Center has indicated the complexities of this 68-acre plant layout. The complexities of the total solid waste system, both in variety of materials generated and methods of handling, processing and disposal of these materials, are equally as great.

### Types of Waste Materials Generated:

Types of conventional solid wastes generated in this plant present similar varieties and quantities as will be found in a municipality of similar size, including:

1. Garbage
2. Rubbish
3. Ashes
4. Dead Animals
5. Special Wastes
6. Bulky Wastes (furnishings, auto parts, tires, etc.)
7. Expended Vehicles
8. Street and Landscaping Refuse
9. Construction and Demolition Wastes
10. Industrial Wastes (shops)

In addition, reusable materials and equipment, such as linens, food service items, patient care items, etc. requiring reprocessing, will be found in quantities that far exceed the amounts of these conventional solid wastes. These reusables have all the handling and transport problems of conventional waste materials, and dependent on future changes in operating policy, single-use (disposable) items may replace certain of these materials, substantially increasing the problem of disposal.

Generally, bulky wastes, worn-out vehicles, street and landscaping refuse, construction and demolition wastes are handled in separate channels apart from the main flow of waste materials generated daily within the plant buildings. Daily quantities of these materials generated fluctuate considerably. Dependent on the nature and quality of these materials, they may be salvaged for in-plant reuse or deposited at landfills. By and large, the methods of disposal selected appear to be satisfactory and are limited by the characteristics of the individual waste materials. Detailed studies of these types of wastes will not be considered further in this study, except as they may be found within the building waste handling system. Similarly, those radiological wastes which are generated in varying quantities and handled in compliance with State and Federal regulations will not be investigated in depth except as they may affect the waste handling system in this building complex.

In summary, the identification of kinds of wastes that may be found in the main stream of the solid waste system include garbage, rubbish, ashes, dead animals, special wastes and reusables. From observations of the different characteristics of certain waste materials and their respective handling requirements within the total system, eight categories of waste materials have been established for detailed study. These categories are identified as follows:

| | |
|---|---|
| 1. Sharps - needles, blades, etc. | (Disposable) |
| 2. Surgical, pathological and animals | (Disposable) |
| 3. Soiled linen | (Reusable) |
| 4. Rubbish or mixed refuse | (Disposable) |
| 5. Patient care items | (Reusable) |
| 6. Non-combustible - glass, metals and ashes | (Disposable) |
| 7. Garbage (Non-grindable) | (Disposable) |
| 8. Food service items | (Reusable) |

Brief Description of the Total System:

Policies of operation of the solid waste system specify relatively direct and simple procedures to be followed. Certain special purpose equipment has been provided for disposal of wastes. Pathologic incinerators provide facilities for disposal of tissue wastes. Grinder installations provide facilities for disposal of food preparation wastes and selected pathologic wastes. Central on-site incineration has generally prevailed over the years for the disposal of other infectious wastes. The balance of disposable wastes are hauled by hospital packer trucks to landfill for final disposal.

An inter-building transfer system, employing tram trains, collects loaded carts at intermediate storage points, transports them via surface, tunnel and corridor routes to central storage points. Infectious wastes are discharged at the central incinerator for disposal. Other disposable wastes are discharged and loaded into a compactor truck for transport to a landfill. Reusable wastes are directed to their respective reprocessing points. The compactor truck also provides collection service from a number of outlying buildings not serviced by the tram train. Direct haul to the landfill is made after each load is collected.

Various methods of waste collection and transport exist within the 28 buildings in this complex. However, generally hand cart collection of materials on each floor prevails. Eight of the multistory buildings have chutes for vertical transport of soiled linens and mixed refuse. The balance of waste materials, both reusables and disposables, are transported by elevators where available or manually via stairs in some of the two and three story buildings to intermediate storage points to await the inter-building pickup.

## Responsibility of Solid Waste Management:

General Services (Housekeeping and Custodial Services) is charged with the responsibility of solid waste management along with other plant services. In performance of the functions in solid waste management, this department must observe those general regulations dealing with building safety, fire prevention, air pollution, sanitation, as well as the applicable requirements of the Hospital Licensing Act.

Operational policies have been adopted by plant administration which provide a means of coordinating all supportive services with the medical activities within the plant. Coordination between the Medical Department, charged with the primary function of patient care services, and the Non-Medical Departments' function of providing all other required support services is accomplished through a system which subdivides the total plant operation into administrative or service areas. Each area is assigned an administrator to provide liaison between Medical and Non-Medical personnel in perfomance of their respective functions.

As related to management of the solid waste system by Housekeeping and Custodial Services, these service areas may be physically defined as follows:

Area 1 – The Outpatient and Admitting Room Administrative Area, consisting of the Outpatient Building (Bldg. No. 3) and the basement and 1st floor of Unit I (Bldg. No. 1).

Area 2 – The Laboratory-Radiology and Surgical Specialties Administrative Areas, consisting of floors 2, 3, 4 and 5 of Unit I (Bldg. No. 1).

Area 3 – The General Medicine Administrative Area, consisting of floors 6, 7 and 8 of Unit I (Bldg. No. 1).

Area 4 – The Medical-Surgical Administrative Area, consisting of floors 9 through 19 of Unit I (Bldg. No. 1).

Area 5 – Psychiatry and Children's Division Administrative Areas, consisting of the Psychiatric Building (Bldg. No. 5) and the Children's Division Building (Bldg. No. 4).

Area 6 – The Obstetrics-Gynecology Administrative Area, consisting of Unit II (Bldg. No. 2).

Two other service areas generally non-medical in function are defined as follows:

Area 7 - The Special Services Area, consisting of all outlying buildings (Bldgs. No. 9 through 28), grounds, service yards and tunnels.

Area 8 - The Resident Hall Area, consisting of the Interns and Nurses Buildings (Bldgs. Nos. 6, 7 and 8).

Organization of Manpower:

The housekeeping and custodial labor force is subdivided into teams serving the total plant. These teams provide all services for the specified service areas, including on-floor refuse collection activities and transport of segregated waste material to intermediate storage points.

A special service team (for Area 7) provides all custodial services to the group of outlying buildings, as well as operation of tram trains, elevators and refuse trucks for transfer of waste materials from intermediate storage areas in all buildings to central storage, processing and disposal points.

Personnel of other departments are involved in certain aspects of handling soiled linen and used food service items. The nursing staff and aides are largely responsible for on-floor handling up to the point of depositing linens in the laundry chutes and placing used food service items on the carts for return. Laundry personnel are assigned to clean out the soiled linen chute rooms, including bagging and placing on soiled linen carts. Dietary personnel, of course, handle cleanup of food carts on the return to the kitchen.

Each of the eight service areas are staffed to furnish services as required on a seven-day week basis. Table II-2 indicates General Services manpower classifications and assignments in each of these areas.

## TABLE II-2 GENERAL SERVICES PERSONNEL

| Personnel Classification | Personnel Assigned by Service Areas | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
| Sr. Foreman | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | 7 |
| Cust. Foreman | 2 | 2 | 2 | 2 | 2 | 3 | 2 | - | 15 |
| Cust. Working Foreman | 3 | 3 | 3 | 4 | 3 | 4 | - | - | 20 |
| Institutional Laborers | 7 | - | - | - | 3 | 2 | 9 | - | 21 |
| Custodians | 74 | 51 | 44 | 61 | 64 | 80 | 43 | 10 | 427 |
| Truck Driver | - | - | - | - | - | - | 3 | - | 3 |
| Tram Operator | - | - | - | - | - | - | 6 | - | 6 |
| Elev. Operator | - | - | - | - | - | - | 36 | - | 36 |
| Chief Hskpr. | - | - | - | - | - | - | - | 1 | 1 |
| Sr. Hskpr. | - | - | - | - | - | - | - | 2 | 2 |
| Housekeepers | - | - | - | - | - | - | - | 48 | 48 |
| Misc. | - | - | - | - | - | - | 18 | - | 18 |
| Total | 87 | 57 | 50 | 68 | 73 | 90 | 118 | 61 | 604 |

## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Comprehensive field observations were conducted during October, November and December, 1968, at the Medical Center to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by principal buildings and/or accumulation points, (3) manpower, and equipment used in the handling and disposal of these materials, and (4) actual methods and practices employed.

Initial inspections at the Medical Center were made to identify the characteristics and functions of the inter-building solid waste system. Upon inspection of the complexities of the inter-building material handling system in which solid wastes were transported, it appeared that extended observations were warranted in this area.

### The Inter-Building Materials Handling System:

Ten major buildings of the plant are connected by a combination of elevated corridors, tunnels, basement corridors and surface lanes providing the basic traffic network for inter-building movement of pedestrians and materials. The remaining 18 buildings are served primarily by surface routes (streets and sidewalks).

The tunnel-corridor network serving the major buildings is the common transport route for the movement of pedestrian traffic (employees and patients), clean materials and dirty materials. Various types of small vehicles (combustion engines and electric powered vehicles) are utilized in this activity. Peak activities in movement of materials and people generally occur at different time intervals; however, overlapping of these functions is common in a routine day. Peak pedestrian movements occur with changes of shifts. Peak activities in movement of clean materials occur with the dispatch of pharmacy supplies, clean linen supplies, food cart movement prior to meal service, and distribution and collection of medical records. Peak activities in movement of dirty materials occur with refuse and soiled linen collection, return of food carts following meal service, and return of reusable equipment associated with patient care. During these peak periods, moderate traffic congestion is noticeable at the terminal (distribution and collection) points in each of the buildings along the tunnel-corridor network.

The center of material handling activity and the major area of congestion exists in the corridors of Unit I wherein trains of food carts, medical records and general supplies are assembled for dispatch and disassembled on return. Through traffic of clean and dirty materials routed to and from the Interns' Residence and Outpatient Clinic must pass through the main corridor. Cleanout of soiled linen and trash rooms adjacent to this corridor and makeup of the carts and trains handling this material generated in Unit I also occurs here. Nearly all general supplies for upper floors of Unit I must be dispatched from this corridor level. Patients being transferred for treatment to Unit I or the Outpatient Clinic must also be moved through the main corridor. The interchange of plant personnel between buildings and working personnel in various departments on the service level of Unit I is a continuing process as required by the daily routine. Due to inadequate warehousing space, corridors are used as an area for overflow storage of new supplies and equipment until permanent storage space becomes available. Substantial congestion is the prevailing condition in the main corridor of Unit I from 6:00 a.m. to 2:00 p.m., when pedestrian and material movements slack off.

Extreme congestion of cart traffic at variable intervals also occurs at both the laundry receiving area and the central storage area [illegible] refuse (former incinerator) with carts often backed up into the adjacent areas of [illegible] tunnel-corridor awaiting unloading or return.

To measure the magnitude of the inter-building materials handling system, observations of the tram train activity over a two day period were recorded. Average daily activity of the three tram trains used in the system was calculated at a combined total of 193 stops for pickup and/or discharge of carts, with a total of 493 cart movements occurring daily. These observations were confined to a ten-hour period during the day and did not include activity after 3:00 p.m., which principally consists of food cart movements for the evening meal and other limited activity. These observations also excluded the tram train assigned exclusively for the movement of pharmacy supplies and other vehicles used in material and people movement. Figures II-3 and 4 were prepared to illustrate hourly activity during the ten hour period and the percentage of activity related to the movement of clean and dirty materials. Including the return movement of food carts, together with soiled linen cart and refuse cart movements, 63% of pickups, 68% of cart movements and 63% of daily time were allocated to solid waste handling.

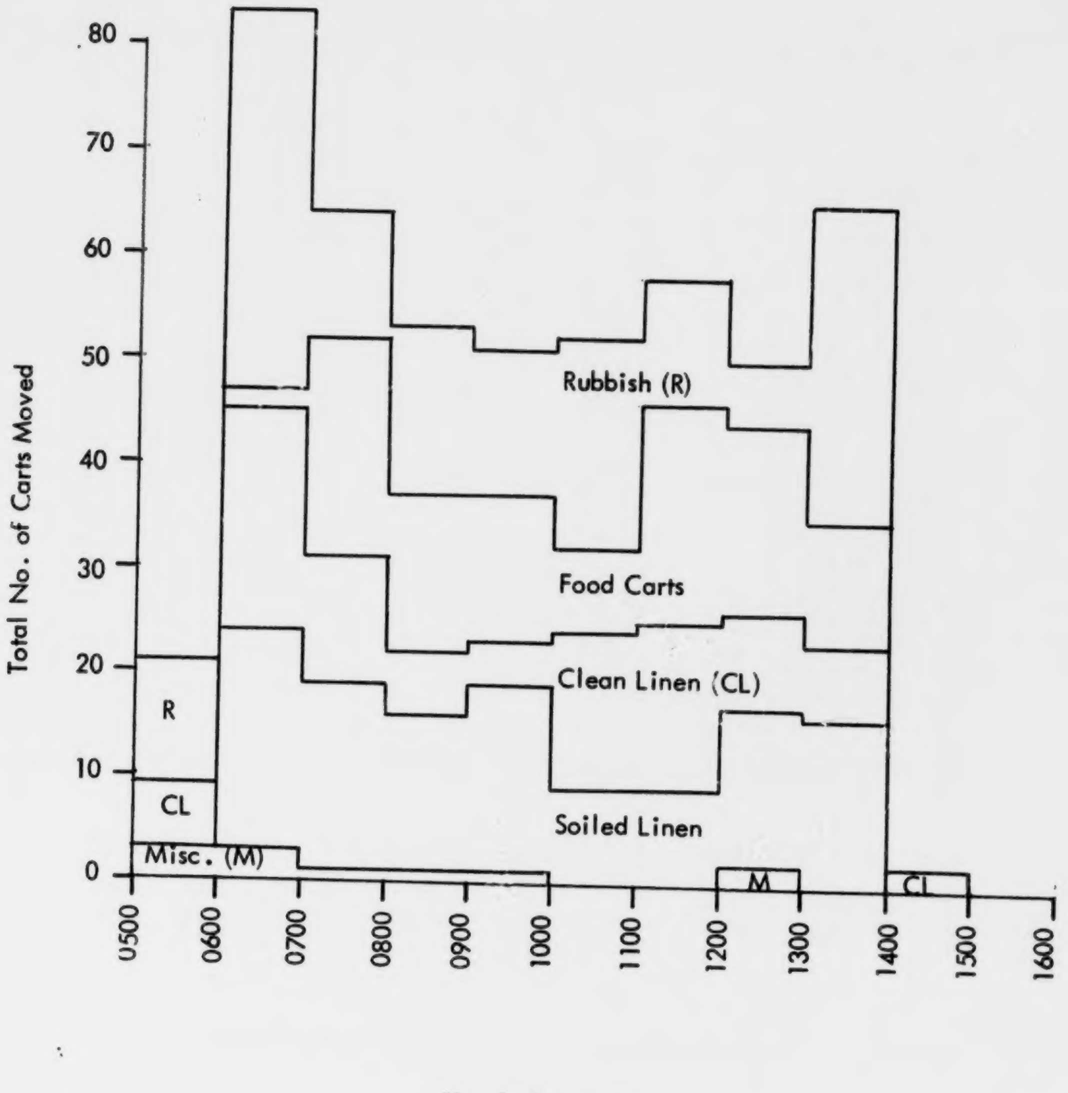


FIGURE II-3 OBSERVATIONS OF DAILY CART MOVEMENT

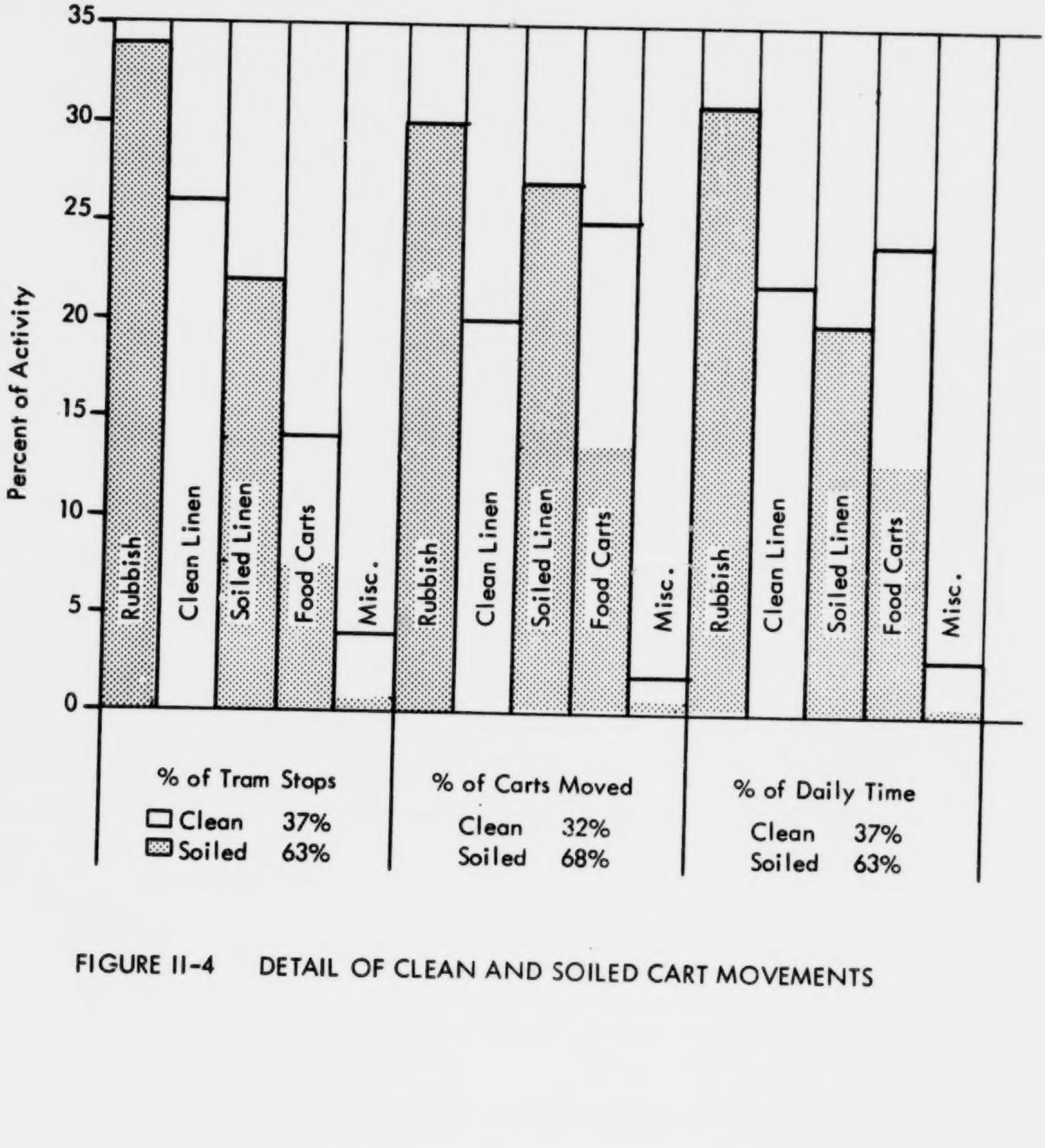


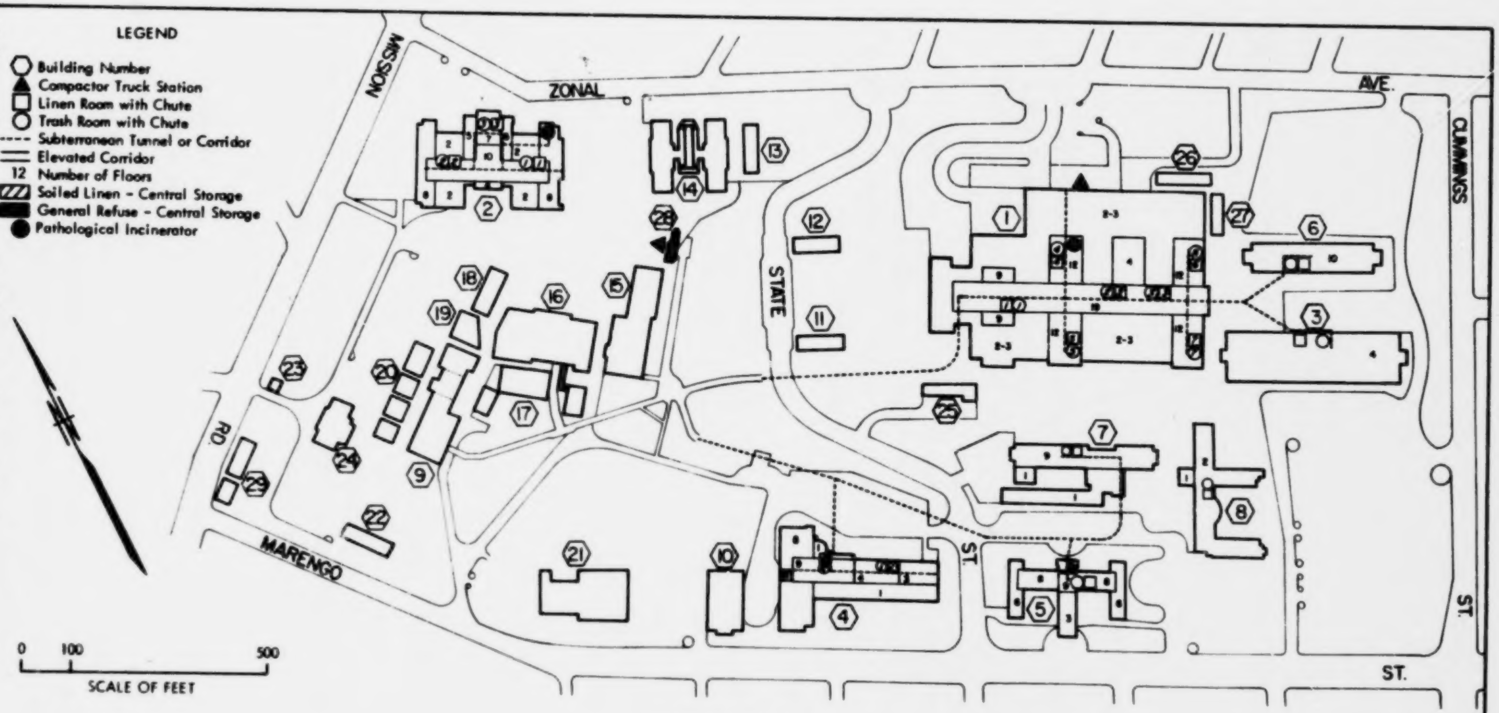
FIGURE II-4 DETAIL OF CLEAN AND SOILED CART MOVEMENTS

Handling and Storage of Disposable Waste Materials:

Figure II-5 illustrates the building layout of this plant and shows the location of the connecting tunnel-corridor network, intermediate and central solid waste storage points, as well as collection stations serving the minor buildings. It will be noted that nine buildings in this complex, varying from 3 to 20 stories in height, collectively contain 18 intermediate trash and soiled linen storage rooms, each being chute fed from the floors above. Other intermediate storage points include the "can room" and "tank carts" in the kitchen area in Unit I. In addition to these principal waste storage points, some 30 refuse collection stations (cans and bins) are located on surface routes throughout the complex.

In each of the trash rooms, a portable bin (cart) of about 2 to 2 1/2 cubic yard capacity with hinged top is positioned to receive the direct discharge from the trash chutes. It is intended that as these carts are filled to capacity, an empty cart will be manually moved into position. Often in practice, this cart movement does not occur until the loaded cart is overflowing and/or the chute is backed up. When these circumstances develop, manual clearing of the chute and cleanup of spilled litter is required. Observations indicate the majority of this mixed refuse is plastic bagged before deposit in the chutes. However, rupturing of bags occurs along with occasional deposits of loose material directly into the chutes. An intermix of reusable equipment items, such as soiled linen, patient care utensils, etc. is commonplace. These salvageable pieces are normally separated when observed and re-channeled into their proper route for reprocessing. As carts are filled during the day, they are moved out of the trash rooms into the adjoining corridors to await pickup by the tram train and transport to the central storage area. Here the carts are uncoupled to await discharge of contents, and are returned to assigned or needed locations on subsequent trips.

Segregated non-combustibles, disposable syringes and needles, and all pathologic wastes are collected in covered containers, then transported via hand cart and elevator to the "can room" located on a branch of the main service level corridor in Unit I. Here materials are assembled for later disposition. The intended systems direct that all materials other than segregated pathologic wastes be loaded on flat bed carts for transport to the central storage area to await disposal. Pathologic wastes are either directed to the pathologic incinerator in Unit I or in Unit II.


LEGEND
⬡ Building Number
▲ Compactor Truck Station
□ Linen Room with Chute
○ Trash Room with Chute
---- Subterranean Tunnel or Corridor
═ Elevated Corridor
12 Number of Floors
▨ Soiled Linen - Central Storage
■ General Refuse - Central Storage
● Pathological Incinerator
0
100
500
SCALE OF FEET
CUMMINGS
ST.
AVE.
ZONAL
MISSION
RD.
MARENGO
STATE
ST.
ST.

BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Unit I - Acute | 19 | 1,285,000 |
| 2 | Unit II - O.B. & Gyn. | 9 | 376,110 |
| 3 | Outpatients | 4 | 209,000 |
| 4 | Pediatrics & C.D. | 8 | 171,075 |
| 5 | Psychiatric | 9 | 132,000 |
| 6 | Interns Residence | 10 | 139,000 |
| 7 | Nurses Res. & Classrooms | 9 | 171,620 |
| 8 | Nurses Residence | 2 | 46,000 |
| 9 | Pharmacy | 6 | 55,000 |
| 10 | General Laboratory | 3 | 33,000 |
| 11 | Chaplain | 1 | 2,750 |
| 12 | tient Identification | 1 | 2,725 |
| 13 | Research Building | 1 | 22,000 |
| 14 | Clinical Research | 4 | 61,000 |
| 15 | Power House | - | -- |
| 16 | Laundry | 2 | 55,200 |
| 17 | Shops | 1 | 12,200 |
| 18 | Research Building | 3 | 14,500 |
| 19 | Garage | 2 | 6,160 |
| 20 | Storage | 1 | 4,100 |
| 21 | Steam Plant | - | -- |
| 22 | Cancer Research | 2 | 10,200 |
| 23 | Gate House | 1 | 2,400 |
| 24 | Admin. (Hosp. Dept.) | 4 | 30,600 |
| 25 | Telephone Exchange | 2 | 6,180 |
| 26 | Storage | 1 | 2,940 |
| 27 | Storage | 1 | 2,270 |
| 28 | Incinerator | - | -- |
| 29 | Classrooms | 1 | 2,000 |

Schematic of Inter-Building Solid Waste System

FIGURE II-5

Non-grindable wastes from the kitchen are deposited in "tank carts". These carts are transferred from the ground floor kitchen to the basement level by elevator to await pickup by the tram train and transport to the central storage area.

Waste Disposal Practices:

At the beginning of the observation period, on-site disposal of the majority of mixed refuse was accomplished by incineration. However, during this period, the incinerator installation,due to violation of air pollution regulations,was forced to shut down, and all waste materials formerly handled by this method were routed to a privately operated landfill via the hospital's compactor truck. During the time incineration was practiced, the carts containing mixed refuse, kitchen wastes, etc. were emptied directly on the upper level charging floor of the incinerator, then scooped (charged) into the furnace in a continuous manner until the capacity of the furnace was reached. Segregated non-combustible materials and accumulations of disposable syringes and needles in cans were stored for later transfer to the landfill.

After incineration was discontinued, an improvised plywood chute was constructed to convey all waste materials from the upper level charging floor to a rear end loader compactor truck on a parking lot grade some 14 feet below. Generally an attempt was made to discharge the carts directly into the chute or in its vicinity. Problems of area littering and sanitation on the charging floor level were similar for both the incineration operation and the truck loading operation; however, the latter method also created additional problems in the area of the truck at ground level. This system was later modified when a new top loading (forklift) truck was acquired. Present methods provide direct chute discharge to the topside receiving hopper of the truck. Spillage has been minimized in the loading operation but windblown littering as well as occasional overcharging of the chute remains a sanitation problem. A second rear loading compactor truck utilized in the plant system is normally stationed at the loading dock at the service level on the north side of Unit I. This loading dock is also utilized as a principal receiving point for incoming supplies. All bulky packaging materials from the warehousing operation and miscellaneous other wastes are loaded directly into this truck during the day. This truck is also employed on a building to building collection system servicing the balance of the outlying buildings in this complex. Due to the nature of this collection system, this truck proceeds to a private landfill for disposal of all materials as loads are collected. Currently (since October, 1968), all wastes formerly incinerated are also hauled to the same landfill for disposal. Observations at this landfill indicate substantial salvage activities occur on a continuing basis at the working faces of the fill. Hospital wastes are routinely handled at discharge points common to all refuse haulers.

At the time of observations, the pathologic incinerator in Unit II was partially disassembled for repairs and the incinerator in Unit I was not used due to malfunction. After the central incinerator was shut down, no alternate method of on-site disposal existed for this material. Due to apparent lack of communications or lack of an awareness of the problem, these materials were inadvertently channeled into the off-site disposal channel by operating personnel. It may be pointed out at this time that the location of the pathologic incinerator in Unit I is at an intermediate level between the basement and the ground floor level. All wastes intended to be handled by this incinerator must be transported to the basement level by hand cart and elevator, and then hand carried up two flights of stairs to the incinerator cubicle. Similarly all residue must be hand carried to the basement level.

Handling and Storage of Reusable Waste Materials:

The routine in handling soiled linen is similar to the methods of handling mixed refuse. The majority of linen gathered on floors is either bagged (cloth) or bundled before deposit in the chutes. Observations at the chute rooms indicate a substantial quantity of the bagged material loosens and scatters on impact and that a sizeable quantity, principally surgical linen, is placed in the chutes in a loose form. As in the case of the trash rooms, a miscellaneous intermix of other reusable materials, as well as rubbish, may be found in the soiled linen rooms. Cleaning out linen rooms involves separation of the extraneous items, rebagging and loading the linen on flatbed soiled linen carts. These are placed in the adjoining corridor to await pickup by the tram train and transport to the receiving area adjacent to the laundry. These materials are either taken directly from the cart to a conveyor belt for manual sorting or unloaded on the nearby soiled stockpile to await the sorting process. At peak activities, soiled linen carts are backed up well into the elevated corridor awaiting handling. At times, assembled clean linen supply carts awaiting tram train distribution further congest this area.

The major reusable material other than linen at this facility generally consists of patient care and food service items, etc. After use, those materials leaving the floors above are transported via cart and elevator to intermediate collection points on the service level to await pickup by the tram trains for transport to their respective stations for reprocessing. However, in the case of patient care utensils, the cleaning process may occur on the floor or at central sterilization stations within the building, not requiring tram train handling. Reusable food service items are, of course, returned on the food carts to the central kitchen cleaning area in Unit I.

Quantities and Types of Disposable Waste Materials:

After identification of methods and practices characteristic of the systems operation, a quantity survey was made to determine daily volume of solid wastes produced in the total plant.

Initially observations were limited to that portion of wastes transported via the tram train to the incinerator which at that time was in operation. Portable scales were located in the vicinity of the incinerator, and a record was prepared identifying all carts by number, tare weight and locations (building, trash room, etc.) where specific carts were assigned. Similarly all accumulation or intermediate storage points were identified by building location. Actual weighing of loaded carts was recorded for a period of eight days to acquire a reasonable cross section of daily activity and to establish a "typical" day's production as delivered to the incinerator. Considerable variations in quantities collected were observed during this period. Observers' comments indicate this was likely due to the variable productivity of labor and/or mechanical problems rather than extreme variations in waste production during the normal week day. However, with limited activity of administrative, outpatient, laboratory and other supportive functions during the weekend, it is obvious that waste production would also be substantially lower during the weekend period.

Tables II-3 and II-4 illustrate typical daily activity occurring during this eight day period in refuse cart movements, distribution of wastes by accumulation points and buildings within the plant, and the breakdown of segregated non-combustible and mixed refuse as delivered to the incinerator area. These summaries do not include the quantities of wastes collected by the compactor truck for landfill disposal.

TABLE II-3 INTER-BUILDING DISPOSABLE WASTE COLLECTION

| Date | Disposable Solid Wastes Transferred | | | | | Cart Movement | |
|---|---|---|---|---|---|---|---|
| | Combustible | | Non-Comb. | | Total (Lbs.) | No./Day | Avg. Net Wt. Lbs./Cart |
| | Lbs. | % Tot. | Lbs. | % Tot. | | | |
| 10-16 (W) | 10,673 | 93.3 | 750 | 6.7 | 11,423 | 84 | 136 |
| 10-17 (Th) | 9,828 | 94.3 | 590 | 5.7 | 10,418 | 81 | 128 |
| 10-18 (F) | 9,833 | 94.8 | 535 | 5.2 | 10,368 | 79 | 132 |
| 10-21 (M) | 7,905 | 94.3 | 480 | 5.7 | 8,385 | 64 | 131 |
| 10-22 (T) | 10,698 | 88.9 | 1,360 | 11.1 | 12,058 | 91 | 132 |
| 10-23 (W) | 10,673 | 93.4 | 750 | 6.6 | 11,423 | 83 | 137 |
| 10-24 (Th) | 8,848 | 88.6 | 1,135 | 11.4 | 9,983 | 82 | 121 |
| 10-25 (F) | 8,535 | 96.8 | 285 | 3.2 | 8,820 | 80 | 110 |
| TOTAL | 76,993 | | 5,885 | | 82,878 | 644 | |
| TYP. DAY | 9,624 | 92.9 | 735 | 7.1 | 10,359 | 80 | 129 |

TABLE II-4 PRODUCTION OF DISPOSABLE WASTES BY BUILDINGS

| Building | | Avg. Lbs. |
|---|---|---|
| No. | Function | Collected Daily |
| 1 | Unit I - Acute | 5,510 |
| 2 | Unit II - OB/Gyn. | 1,570 |
| 3 | Outpatients | 930 |
| 4 | Ped./CD | 640 |
| 5 | Psychiatric | 570 |
| 6 | Interns | 400 |
| 7 | Nurses | 150 |
| 9 | Pharmacy | 80 |
| 10 | Gen'l. Lab | 60 |
| 16 | Laundry | 220 |
| - | Misc. | 170 |
| | TOTAL | 10,300 |

Shortly after this eight-day period of observations, the incinerator was closed down and a new system was improvised by General Services to haul all wastes to the landfill with the addition of one compactor truck. To complete the quantity survey, including all wastes now handled by both trucks, it was necessary to ride both vehicles and obtain weight records at the landfill. Observers on the trucks after obtaining tare weights, recorded refuse weights for a period of four days and the truck operators continued to provide scale records for an additional four day period. Table II-5 illustrates the truck weight records for this additional period of time, including the combined quantities of wastes which were formerly incinerated with those previously collected and hauled to the landfill. Total daily activity during this eight day period indicated 4.4 trips averaging 4,600 pounds (2.3 tons) or 20,550 pounds (10.25 tons) of disposable solid waste material were hauled daily to the private landfill. General observations of the truck activity prior to the incinerator shut down

## TABLE II-5 LOAD RECORD 8-DAY PERIOD

| Date | Truck No. 3368 | | Truck No. 3369 | | Total Daily Refuse Hauled |
|---|---|---|---|---|---|
| | Tare Wt. 18,660 Lbs. | | Tare Wt. 18,560 Lbs. | | |
| | Gross Wt. | Net Wt. | Gross Wt. | Net Wt. | |
| 12-3 (Tues.) | 21,220 | 2,560 | 24,630 | 6,070 | |
| | --- | --- | 24,500 | 5,940 | 14,570 |
| 12-4 (Wed.) | 20,830 | 2,170 | 24,740 | 6,180 | |
| | 25,000 | 6,340 | 20,800 | 2,240 | |
| | 24,560 | 5,900 | --- | --- | |
| | 23,600 | 4,940 | --- | --- | 27,770 |
| 12-5 (Thurs.) | 24,120 | 5,460 | 21,320 | 2,760 | |
| | 24,100 | 5,440 | 22,412 | 3,762 | |
| | 24,760 | 6,100 | --- | --- | 23,522 |
| 12-6 (Fri.) | 24,870 | 6,210 | 21,530 | 2,970 | 9,180 |
| 12-7 (Sat.) | 24,550 | 5,890 | 21,580 | 3,020 | |
| | 24,631 | 5,971 | 22,630 | 4,070 | |
| | 24,515 | 5,855 | --- | --- | 24,806 |
| 12-8 (Sun.) | 24,605 | 5,945 | 21,453 | 2,893 | |
| | 24,320 | 5,660 | 22,300 | 3,740 | 18,238 |
| 12-9 (Mon.) | 24,610 | 5,950 | 20,650 | 2,090 | |
| | 23,730 | 5,070 | 19,915 | 1,355 | |
| | 24,750 | 6,090 | --- | --- | 20,555 |
| 12-10 (Tues.) | 24,300 | 5,640 | 21,430 | 2,870 | |
| | 24,820 | 6,160 | 23,410 | 4,850 | |
| | 24,863 | 6,203 | --- | --- | 25,723 |
| No. of Trips: | | | | | |
| Avg./Day | | 2.5 | | 1.9 | 4.4 |
| Total Waste | | | | | |
| Avg. Day (Lbs.) | | 13,700 | | 6,850 | 20,550 |
| Avg. Load (Lbs.) | | 5,500 | | 3,700 | 4,600 |

indicated it was making about three to four trips a day hauling estimated average loads of about one and a half tons or about 9,000 to 12,000 pounds daily. Final observations of the combined activity of both trucks reasonably confirmed these quantity estimates.

Following the above observations on the principal disposable wastes, there remained only two basic types of wastes with unknown quantities. These materials were food preparation wastes deposited directly in kitchen grinders and pathological wastes for disposal by incineration.

Hospital personnel in Dietary and Pathology assisted in determination of quantities of these materials in order to minimize disruption in these very active departments. The Chief Dietitian selected a day with menu requirements of foods with high volume of preparation wastes, which are the principal materials handled by the grinder installations. Personnel in the various preparation areas segregated this material and weighed the accumulated wastes prior to charging the grinders. Results of this activity presented a combined daily total of all food preparation wastes of 2,600 pounds. At the time of this survey, about 10,000 meals per day were prepared or it can be related that up to 0.26 pounds of waste per meal may be expected.

Surgery, autopsy and the laboratories generate the major quantities of segregated pathologic wastes. Technicians in these services over a three day period estimated volumes of wastes accumulated each day for disposal by the pathologic incinerator at approximately 187 gallons. Using a density factor of 5.2 lbs./gal. based on an allowed 70% moisture factor for this type of material, it is indicated that a total production of about 1000 lbs./day may be expected from these combined sources. Distribution of this material generated by the major producers for disposal by incineration is as follows:

| | | |
|---|---|---|
| Unit I | - Basement - Lab Services | 30 gallons per day |
| | 2nd Floor - Autopsy and Lab Areas | 80 gallons per day |
| | 2nd Floor - Laboratories | 45 gallons per day |
| | 16th Floor - Pathology Lab | 30 gallons per day |
| Unit II | - 4th Floor - Surgical-Delivery | 2 gallons per day |

The prevailing handling practice at the time of observations involved storage of materials in closed containers with plastic liners, with delivery once daily via cart and/or elevator to the Can Room in Unit I for intermediate storage prior to disposal. Interviews with various personnel involved in handling and dispatch of these materials indicated differences of opinion as to routing and storage procedures.

Quantities and Types of Reusable Waste Materials:

To complete the quantity survey, data on reusable supplies and equipment classified as solid waste material in this study had to be developed. The principal identifiable materials in quantity in this classification are soiled linens, patient care and food service items.

Laundry records were found to be quite comprehensive, and daily weight records of soiled linen processed were readily available. Utilizing the most current month's records that were typical (October, 1968), an average calendar day production of some 45,500 pounds was calculated opposed to an average of 56,500 pounds processed daily. Table II-6 itemizes daily activity by shifts for the total number of days worked in the month of October.

Reusable food service items collected from the wards was calculated on the basis of number of patient meals served daily. Some variations occur with type of food service for various meals; however, an average of 1 1/2 lbs./patient meal was estimated. Based on 6,000 patient meals served per day, a daily quantity of some 9,000 pounds may be expected for return from the wards in food carts to the kitchen for reprocessing.

Patient care items presented greater difficulty in identifying a consistent handling system and basis for estimating quantities. In the case of patient care utensils, in most buildings cleaning or sterilizing facilities are available on each ward or within the building, and these materials are seldom seen in the inter-building system. The major reusable supplies circulated within the inter-building are reusable bottles from Pharmacy. These are generally transferred exclusively in racks or cartons by the Pharmacy tram train on the

## TABLE II-6 SOILED LINEN PROCESSING - OCTOBER 1968

| Date | Processing by Shifts (Lbs./Day) | | |
|---|---|---|---|
| | 1st Shift | 2nd Shift | Total |
| 1 | 21,970 | 19,085 | 41,055 |
| 2 | 29,970 | 24,890 | 54,860 |
| 3 | 29,135 | 30,545 | 59,680 |
| 4 | 29,530 | 29,307 | 58,837 |
| 5 | 19,845 | --- | 19,845 |
| 7 | 29,760 | 26,290 | 56,050 |
| 8 | 28,813 | 28,500 | 57,313 |
| 9 | 27,640 | 29,880 | 57,520 |
| 10 | 22,885 | 30,340 | 53,225 |
| 11 | 27,865 | 30,370 | 58,235 |
| 14 | 26,500 | 29,690 | 56,190 |
| 15 | 30,290 | 31,250 | 61,540 |
| 16 | 28,360 | 30,525 | 58,885 |
| 17 | 31,410 | 30,930 | 62,340 |
| 18 | 32,525 | 30,905 | 63,430 |
| 19 | 18,675 | --- | 18,675 |
| 21 | 31,730 | 30,885 | 62,615 |
| 22 | 27,700 | 33,845 | 61,545 |
| 23 | 30,775 | 32,950 | 63,725 |
| 24 | 32,220 | 31,890 | 64,110 |
| 25 | 28,995 | 29,215 | 58,210 |
| 28 | 31,980 | 31,930 | 63,910 |
| 29 | 31,085 | 31,350 | 62,435 |
| 30 | 33,295 | 32,293 | 65,588 |
| 31 | 33,925 | 32,790 | 66,715 |
| TOTAL | 716,878 | 689,655 | 1,406,533 |
| | Average Lbs. Per Working Day | | 56,500 |
| | Average Lbs. Per Calendar Day | | 45,500 |

return of carts to this department and then reprocessed in the bottle washing section. Observations during the entire period at this plant indicate that total patient care items expected to be handled daily in the inter-building system will be represented in trace amounts only.

Summary of Total Waste Production:

In summary, Table II-7 presents the types and quantities of wastes that may be expected to be generated daily at the Medical Center under its present level of service, and relates these quantities to the number of bed patients, number of employees and combined plant population, as well as total floor area of this building complex. The closing chapter of this volume will summarize our findings on all hospitals under study and attempt to establish patterns in the relationship of population or plant size to total waste production.

Equipment and Building Areas Used in System Operation:

For later economic analysis of the solid waste system, identification of all elements which contribute to its function is necessary. Included in these elements are building areas and equipment used exclusively in waste handling, storage, processing and disposal, and equipment shared with other services.

Excluding the numerous trash and soiled linen chute rooms considered as cost elements of the in-building system, building areas used in the inter-building waste system are limited to (1) the abandoned incinerator presently used as a central storage and loading area for disposable wastes, (2) the covered storage area for soiled linen, and (3) the two rooms housing pathologic incinerators. Collectively, the replacement costs of present covered storage area requirements for disposable wastes and soiled linens (about 2,000 square feet) should not exceed a nominal $20,000.00 investment. The pathologic incinerator rooms (about 250 square feet of building area) based on a nominal $25.00 per square foot building cost allowance would represent an investment of about $6,000.00. The balance of areas in the inter-building system used for storage and processing as well as transfer routes are of mixed use and cannot be directly

## TABLE II-7 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors Lbs./Bed Patient | Lbs./Capita |
|---|---|---|---|---|
| Sharps, Needles, Etc. | 75 | .1 | TR | TR |
| Path. & Surgical | 1,000 | 1.3 | .5 | TR |
| Soiled Linen | 45,500 | 58.6 | 22.8 | 2.2 |
| Rubbish | 16,200 | 20.9 | 8.1 | .8 |
| Reusable Patient Items | TR | TR | TR | TR |
| Non-Combustibles | 1,500 | 1.8 | .7 | TR |
| Garbage (Non-Grindable) | 1,800 | 2.3 | .9 | .1 |
| Food Service Items | 9,000 | 11.6 | 4.5 | .4 |
| Ash & Residue | TR | TR | TR | TR |
| Animal Carcasses | 25 | TR | TR | TR |
| Food Waste (Grindable) | 2,600 | 3.4 | 1.3 | .1 |
| TOTAL WASTES | 77,700 | 100.0 | 38.8 | 3.7 |
| Total Disposable | 23,200 | 29.9 | 11.6 | 1.1 |
| Total Reusable | 54,500 | 70.1 | 27.2 | 2.6 |

*Based Avg. Census of 2,000 Bed Patients Daily and Gross Population of 21,000

Note - Total Production Related to Gross Bldg. Area of 3,000,000 SF:
Disposables @ 7.5 Lbs./MSF, Reusables @ 18.1 Lbs./MSF
or Total of 25.6 Lbs./MSF Daily.

allocated to the waste system.

The principal equipment acquired for exclusive use in the inter-building waste system includes the pathologic incinerators, all soiled linen carts, trash carts and portable bins. The equivalent of two tram train power units are also used in transporting reusable and disposable waste materials. The balance of carts used for transport of clean supplies and return of reusables or disposable materials should be allocated to the movement of clean supplies and not to the waste system.

Equipment utilized in the off-site system is limited to the 13 cubic yard compactor truck providing the building to building collection service and the new 33 cubic yard compactor truck which handles the majority of materials formerly incinerated.

A summary of these elements in the inter-building and off-site systems is presented in Table II-8, which shows the inventory and cost allowance of each item. This estimate based on approximate replacement costs indicates a capital investment of about $68,250.00 required to duplicate building areas and equipment used in the inter-building system, and $52,000.00 for equipment used in the off-site system.

TABLE II-8 COSTS OF BUILDING AND EQUIPMENT IN INTER-BUILDING AND OFF-SITE SYSTEM

| | | | Est. Value |
|---|---|---|---|
| Inter-Building System: | | | |
| Building Areas (Incinerator rooms & covered storage areas) | | | $ 26,000 |
| Equipment: | | | |
| 2 - Tram Train Tractors | @ $3000 = | $ 6,000 | |
| 10 - Flatbed Trash Carts | @ 200 = | 2,000 | |
| 35 - Portable Trash Bins | @ 350 = | 12,250 | |
| 30 - Soiled Linen Carts | @ 200 = | 6,000 | |
| 8 - Tank Carts | @ 750 = | 6,000 | |
| 2 - Patho. Incinerators | @ 5000 = | 10,000 | |
| ESTIMATED EQUIPMENT COST | | | 42,250 |
| Off-Site System: | | | |
| 1 - 13 CY Compactor Truck | | 15,000 | |
| 1 - 33 CY Compactor Truck | | 37,000 | |
| ESTIMATED EQUIPMENT COST | | | 52,000 |
| EST. REPLACEMENT COST OF BUILDINGS AND EQUIPMENT | | | 120,250 |

Subcontract Services and Disposal Fees:

A disposal fee for those materials hauled to the private landfill has been established at $4.00 per ton, plus $1.00 per load for special handling of hospital wastes. In practice, loads are not generally weighed and charges are made on a truck load basis. However, based on the daily production of about 10 tons and using the above rates, charges should be in the range of $45 to $50 per day for off-site disposal, dependent on the number of loads required. With the larger compactor truck recently added to the system, the minimum rate will probably be achieved.

One contract not specifically related to the economic analysis of the inter-building and off-site system has been issued to a private contractor for collection, transportation and disposal of radioactive waste material in accordance with State and Federal regulations. This contract provides for removal of special 55 gallon containers at a cost of $27.55 per container. Current experience indicates about eight drums per year are handled.

Personnel Requirements:

From field records of the entire period of observations, it is estimated that average daily activity of the inter-building and off-site systems involves an equivalent of about sixteen men. About one third of this manpower is represented by truck and tram operators, with the remainder consisting of laundry workers, institutional laborers, custodians, etc. performing loading, unloading or other handlings of the various types of waste materials. Further detail on the labor force, including cost data, is shown later in this chapter.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at the Medical Center were carried out to determine the detailed functions of the in-building operation (Unit and Inter-Unit Systems). Cursory inspection of the major buildings in the plant was accomplished with the assistance of area supervisors of Housekeeping and Custodial Services. The purpose of this inspection was primarily to compare methods and practices employed in the various departments and buildings and to select "typical" wards and stations for in-depth observations.

### General:

These cursory inspections revealed or confirmed the complexity and confusion that usually exists within the waste handling operations of hospitals. These complexities are "built-in" through the multitude of different materials and supplies that are distributed and used throughout the hospital daily. Emphasis is placed on the importance of distribution of new materials with little direction given in handling the residual waste materials.

Detailed studies by staff members of the University of Minnesota(1) have been made previously in the field of hospital wastes, cataloging and itemizing typical components of mixed refuse to be found in various hospitals. These materials can be broadly categorized into (1) wood and paper products, (2) cloth or fiber, (3) plastics and rubber, (4) plants and miscellaneous foods, (5) miscellaneous non-combustibles, (6) medications, and (7) reusables.

In addition to these categories of wastes that are generated throughout the hospital, additional concentrations of wastes requiring special handling are occasionally passed into the general waste system, bypassing intended channels. Similarly, in many cases, mixed refuse of the above material categories, dependent on point of generation, such as isolation wards, etc., are also intended for special handling but are inadvertently channeled into the general waste system. Confusion in proper handling methods may be introduced by high turnover of personnel, difficulty in identifying the material after it passes through the first hands, language difficulty, morale, and improper equipment.

(1) Bacterial Contamination From Hospital Solid Waste, R. G. Bond and G. S. Michaelsen, Research Grant EF-00007-04 National Institute of Health, 1964.

First observations confirmed the general kinds and intermix of materials prevailing in the system. Rather than devote extensive field time to cataloging the components of the mixed waste materials, observations were directed to the mechanics of handling, handling techniques associated with all types of wastes, equipment used, and time devoted by personnel classifications in various aspects of waste handling in an effort to establish operating standards, efficiencies, and a basis of determining costs of the present waste system operation.

Initial inspections were confined to the Acute Unit (Building 1), O.B./Gyn. (Building 2), Outpatients (Building 3), Communicable Disease (Building 4), Psychiatric (Building 5), and various laboratories and kitchen areas. Observations, together with interviews with custodial personnel and supervisors, as well as floor nurses and nurses' supervisors, assisted in providing a basis of labor estimates.

Handling of Disposable Waste Materials:

It was generally observed, as may be expected, that disposable wastes are created and/or handled by all personnel, patients and visitors in a continuing daily flow. However, upon deposit in the initial container, handling of disposable wastes immediately becomes limited to the Housekeeping and Custodial staff.

Wastebaskets in patients' rooms and other initial containers are usually wiped out with disinfectants and lined with plastic bags after use. Floor workers, along with general cleaning duties, empty these containers by removing the filled plastic bags and placing them into a plastic lined cloth bag suspended on the custodial cart. When the plastic liner is filled, a custodian wheels the cart to the nearest trash chute, ties the bag closed, and deposits it in the chute.

Though a relatively simple system, breakdowns occur due to innumerable reasons, including shortages of plastic bags, monotony of the routine, etc. Plastic liners are on occasion omitted from containers or from the cloth bag on the custodial cart. Occasionally, the plastic liners of the cloth bag are filled to excess and cannot be tied or are too large to enter the chute door. These circumstances then create additional time, effort and risk in handling. Typical alternative handling methods may include (1) dumping of loose material in chutes, (2) hand carried or stretcher borne bags of trash transported by elevator to the intermediate storage rooms, (3) improper storage on the floor, and (4) rebagging of materials for deposit in chutes, all of which give greater exposure of the environment to the material and increase handling costs.

Miscellaneous segregated waste materials on each floor, including non-combustible items, syringes and needles, and double-bagged medical wastes, as well as surgical and pathological wastes from limited locations, are collected separately in cans, which are manually transported by custodial personnel via elevator or stairs to service level intermediate storage locations for later retransfer to selected disposal stations.

Handling of Reusable Waste Materials:

Custodial personnel are not as greatly involved in the initial handling of reusable waste materials. The nursing staff and nurses aides (attendants) are the primary handlers of this material prior to use and after its conversion from clean to dirty classification. They remove soiled linen, bag (cloth) or bundle the material and hand carry it to the nearest chute for deposit in same. Highly contaminated linens from certain areas may be double-bagged or plastic-bagged prior to deposit within the chute system. Similarly, they also collect used food service items from patient rooms after meals, bag disposable food wastes, and assemble all implements on food carts to await pickup by custodial personnel. These carts are then escorted via elevator transport, and grouped at intermediate collection points at service level to await the inter-building transfer to the main kitchen. Patient care items are also collected by nurses or attendants and hand carried to on-floor cleaning and/or sterilizing facilities for reprocessing. Reusable bottles, largely from the pharmacy department, are collected as required, placed in racks or cartons and stored in utility rooms or corridors until picked up by pharmacy personnel for return via elevator and tram train for reprocessing.

Personnel Requirements:

Minor variations occur in the on-floor unit system of handling solid wastes. However, the previously described methods prevail in the major waste-producing areas. To relate personnel requirements to this operation, various departments and typical wards were observed. Four wards were selected for detailed observations of personnel involved in the daily routines of housekeeping functions. Observations of shift routines at each of these wards were made over a period of four days, recording time devoted to handling of the principal solid waste material, including sharps, soiled linen, patient care and food service items, rubbish and non-combustibles.

The observed time devoted to waste handling as recorded was consistently less than estimated by the various supervisory personnel in each classification. It also appeared more reasonable as a basis for this estimate and determination of unit factors that could be used in projecting total estimated manpower requirements. Similar observations were made in other areas of the in-building system and composite time factors of all personnel involved in waste handling were developed. These factors were related to the major types of wastes and were resolved to minutes per day per bed patient in handling each material. Projections of total manhour and equivalent manday requirements for the in-building system, shown in Table II-9, indicate an equivalent of 180 mandays are required daily in these waste handling activities. Table II-9 also relates this labor force to personnel classifications and shows the composite time factor (minutes/bed) utilized in these projections.

As noted earlier in this report, estimated labor is specifically limited to (1) the handling of disposable waste materials from the point of initial deposit through the point of disposal and (2) the handling of reusable materials after use up to the point of storage or accumulation preceding reprocessing. Estimated labor as shown does not include general cleaning duties of custodians or handling of clean supplies that may later be converted to wastes.

TABLE II-9 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| | Manhours by Personnel Classifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type of Waste | Nurses | Aides | Cust. | Lndry. Wrkr. | (1) Other | Total | Equiv. Man Days | Min. Per Bed |
| Sharps | -- | -- | 92 | -- | -- | 92 | 11 | 2.8 |
| Soiled Linen | 94 | 94 | 67 | 34 | -- | 289 | 36 | 8.7 |
| Reusable Patient Items | 16 | 66 | -- | -- | -- | 82 | 10 | 2.5 |
| Food Service Items | 142 | 142 | -- | -- | 7 | 291 | 36 | 8.7 |
| Rubbish | -- | -- | 559 | -- | -- | 559 | 70 | 16.7 |
| Non-Comb. | -- | -- | 95 | -- | -- | 95 | 12 | 2.9 |
| Other (2) | -- | -- | -- | -- | 44 | 44 | 5 | 1.3 |
| TOTAL | 252 | 302 | 813 | 34 | 51 | 1452 | 180 | 43.6 |
| Equivalent Man Days | 31 | 37 | 102 | 4 | 6 | -- | 180 | -- |

(1) Lab. Tech., Food Service Worker, Elev. Operator, Institutional Laborer

(2) Pathological, Garbage (Non-Grindable), Radiological

Table II-10 was prepared to illustrate the manpower load requirements on major personnel classifications involved in the in-building solid waste system. It shows average daily personnel available (7 day basis) and the number and percent required for handling of solid wastes. Further detail on personnel requirements, including cost estimates, in handling of solid wastes within the various components of the system will be presented at the close of this chapter.

TABLE II-10 LABOR REQUIREMENTS OF IN-BUILDING WASTE SYSTEM

| Personnel Classifications | Man Day Distribution<br>(1) Total Available | Required for Waste Handling<br>Man Days | % of Tot. |
|---|---|---|---|
| Nurses | 1,047 | 31 | 2.9% |
| Nurses Aides | 2,272 | 37 | 1.6% |
| Custodians | 327 | 102 | 31.2% |

(1) 7-Day Basis (5/7 of Ordinance Positions)

Equipment and Building Area Requirements:

Principal building areas and equipment utilized in the in-building waste system are limited to the soiled linen and trash rooms, shaftways housing chutes and the fixed equipment (chutes and access doors). Collectively, the 18 pairs of soiled linen and trash rooms, together with shaftways, chutes and hardware, represent an investment estimated at about $345,000 in building and equipment exclusively used by the in-building solid waste system. Table II-11 shows the breakdown of these costs based on nominal allowances of $25.00 per square foot for building area and $3.00 per cubic foot for shaftways.

TABLE II-11 BUILDING AREAS AND EQUIPMENT OF THE IN-BUILDING SYSTEM

| Building Areas and Volumes: | | Est. Value |
|---|---|---|
| 1 Can Storage Room | 500 SF @ $25/SF | $ 12,500 |
| 18 Trash Rooms @ Avg. 155 SF Area = 2800 SF @ $25/SF | | 70,000 |
| 18 Soiled Linen Rooms @ Avg. 275 SF Area = 5000 SF @ $25/SF | | 125,000 |
| 3620 LF Chute-Shafts @ 6 CF/LF = 21,720 CF @ $3/CF | | 65,160 |
| | Total Building Value Allowance | $272,660 |
| **Fixed Equipment:** | | |
| 3620 LF Trash and Linen Chutes @ $20/LF Installed | | $ 72,400 |
| TOTAL BLDG. & FIXED EQUIPMENT | | $345,060 |

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

Building, equipment and labor involved in the system operation have been explored in detail in the preceding sections of this chapter. An investment of some $370,000 has been calculated for those portions of the physical plant and fixed equipment that are exclusively used in solid waste handling functions. Projecting the estimated value of buildings and fixed equipment on a thirty-five year basis with a nominal interest rate of 5% (average annual amortization rate at 6.107%) results in an average expense of about $23,000 per year, or $63.00 per calendar day. A reasonable budget allowance for maintenance and repairs of these types of facilities should be equal to about 2% of building costs, or some $7,400 a year, or $20 per day.

Operating costs for vehicular equipment will include such items as maintenance and repairs, tires, fuel, service, licenses, etc. For the most part, though all power vehicles are operated on relatively low mileage basis, most of the equipment is operated at least at idling speed during active work shifts. Therefore, an average of 8 hours per day on a 7 day week basis or about 3,000 operating hours per year has been allowed in the following calculations of total annual and average daily equipment costs. Table II-12 summarizes the equipment referred to earlier in this report, together with capital and operating expenses they represent.

## TABLE II-12 ESTIMATED ANNUAL EQUIPMENT OPERATING COST

| Equipment Item | Cost Allowance | Oper. & Maint. Cost | Annual Oper. & Maint. Cost | Annual Depreciation | Total Annual Cost |
|---|---|---|---|---|---|
| 1-33 CY Comp. Truck | $37,000 | $3.50/Hr. | $ 10,500 | $ 3,700 | $14,200 |
| 1-13 CY Comp. Truck | 15,000 | 2.50/Hr. | 7,500 | 1,500 | 9,000 |
| TOTAL OFF-SITE EQUIPMENT | | | $ 18,000 | $ 5,200 | $23,200 |
| 2-Tram Train Tractors | $ 3,000 | $1.25/Hr. | $ 7,500 | $ 600 | $ 8,100 |
| 10-Flatbed Trash Carts | 200 | 10% of Val. | 200 | 200 | 400 |
| 35-Portable Trash Bins | 350 | 10% of Val. | 1,225 | 1,225 | 2,450 |
| 30-Flatbed Linen Carts | 200 | 10% of Val. | 600 | 600 | 1,200 |
| 8-Tank Carts | 750 | 10% of Val. | 600 | 600 | 1,200 |
| 2-Pathol. Incin. | 5,000 | -- | 1,000 | 1,000 | 2,000 |
| TOTAL INTER-BUILDING EQUIPMENT | | | $11,125 | $ 4,225 | $15,350 |
| TOTAL EQUIPMENT | | | $29,125 | $ 9,425 | $38,550 |

In addition to the foregoing costs, labor for the total system, including payroll taxes and insurance and social benefits, has been calculated at about $2,275,000 annually or $6,232 per calendar day. Table II-13 relates types of employees involved in waste handling and the distribution of estimated labor costs to the various types of wastes (reusables and disposables) and components of the total waste system.

TABLE II-13

## ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

LAC-USC MEDICAL CENTER

| | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Custodian | $3.71 | 17.0 | $ 63.07 | $ 63.07 | Custodian | $3.71 | 75.0 | $278.25 | $278.25 | Tram Dr. | $4.03 | 0.5 | $ 2.02 | $ 6.05 | Inst. Lab. | $4.03 | 2.1 | $ 8.46 | $ 11.78 | $ 359.15 |
| | | | | | | | | | | | Inst. Lab. | 4.03 | 1.0 | 4.03 | | Truck Dr. | 4.74 | 0.7 | 3.32 | | |
| Pathological and Surgical | Lab. Tech. | 4.12 | 1.0 | 4.12 | 5.98 | Custodian | 3.71 | 0.5 | 1.86 | 1.86 | Inst. Lab. | 4.03 | 2.0 | 8.06 | 8.06 | | | | | | 15.90 |
| | Custodian | 3.71 | 0.5 | 1.86 | | | | | | | | | | | | | | | | | |
| Soiled Linen | Nurse | 5.72 | 94.0 | 537.68 | 1100.21 | Laund. Wk | 3.25 | 34.0 | 110.50 | 110.50 | Tram Dr. | 4.03 | 6.5 | 26.20 | 44.73 | | | | | | 1255.44 |
| | Attendant | 3.34 | 94.0 | 313.96 | | | | | | | Laund. Wk | 3.25 | 5.7 | 18.53 | | | | | | | |
| | Custodian | 3.71 | 67.0 | 248.57 | | | | | | | | | | | | | | | | | |
| Rubbish | Custodian | 3.71 | 535.0 | 1984.85 | 1984.85 | Inst. Lab. | 4.03 | 24.0 | 96.72 | 96.72 | Tram Dr. | 4.03 | 5.1 | 20.55 | 20.55 | Inst. Lab. | 4.03 | 18.9 | 76.17 | 132.58 | 2234.70 |
| | | | | | | | | | | | | | | | | Truck Dr. | 4.74 | 11.9 | 56.41 | | |
| Reusable Patient Items | Nurse | 5.72 | 15.0 | 91.52 | 311.96 | | | | | | | | | | | | | | | | 311.96 |
| | Attendant | 3.34 | 66.0 | 220.44 | | | | | | | | | | | | | | | | | |
| Non-Combustible | Custodian | 3.71 | 20.0 | 74.20 | 74.20 | Custodian | 3.71 | 75.0 | 278.25 | 278.25 | Tram Dr. | 4.03 | 0.5 | 2.02 | 6.05 | Truck Dr. | 4.74 | 0.6 | 2.84 | 2.84 | 361.34 |
| | | | | | | | | | | | Inst. Lab. | 4.03 | 1.0 | 4.03 | | | | | | | |
| Garbage (Non-Grindable) | Fd. Srv. Wk | 3.42 | 6.0 | 20.52 | 20.52 | Fd. Srv. Wk | 3.42 | 4.5 | 15.39 | 20.96 | Tram Dr. | 4.03 | 4.5 | 18.14 | 18.14 | Inst. Lab. | 4.03 | 17.8 | 71.73 | 122.45 | 182.07 |
| | | | | | | Elev. Op. | 3.71 | 1.5 | 5.57 | | | | | | | Truck Dr. | 4.74 | 10.7 | 50.72 | | |
| Food Service Items | Nurse | 5.72 | 142.0 | 812.24 | 1286.52 | Elev. Op. | 3.71 | 7.25 | 26.90 | 26.90 | Tram Dr. | 4.03 | 3.5 | 14.11 | 89.78 | | | | | | 1403.20 |
| | Attendant | 3.34 | 142.0 | 474.28 | | | | | | | Fd. Srv. Wk | 3.42 | 18.0 | 61.56 | | | | | | | |
| | | | | | | | | | | | Inst. Lab. | 4.03 | 3.5 | 14.11 | | | | | | | |
| Radiological | Lab. Tech | 4.12 | 0.5 | 2.06 | 2.80 | Elev. Op. | 3.71 | 0.3 | 1.11 | 2.22 | Custodian | 3.71 | 1.0 | 3.71 | 3.71 | | | | | | 8.73 |
| | Custodian | 3.71 | 0.2 | 0.74 | | Custodian | 3.71 | 0.3 | 1.11 | | | | | | | | | | | | |
| Ash & Residue | Inst. Lab. | 4.03 | 0.1 | 0.40 | 0.40 | Inst. Lab. | 4.03 | 0.1 | 0.40 | 0.40 | Tram Dr. | 4.03 | 0.1 | 0.40 | 0.40 | Inst. Lab. | 4.03 | 0.2 | 0.81 | 1.28 | 2.48 |
| | | | | | | | | | | | | | | | | Truck Dr. | 4.74 | 0.1 | 0.47 | | |
| Animal Carcasses | Lab. Tech. | 4.12 | 0.75 | 3.09 | 3.09 | | | | | | Lab. Tech. | 4.12 | 0.5 | 2.06 | 2.06 | | | | | | 5.15 |
| Food Waste (Grindable) | Fd. Srv. Wk | 3.42 | 27.0 | 92.34 | 92.34 | | | | | | | | | | | | | | | | 92.34 |
| | | | | | $4945.94 | | | | | $816.06 | | | | | $199.53 | | | | | $270.93 | $6232.46 |

Certain other operating costs lie in the area of the miscellaneous expendable supplies, such as replaceable containers and disposable bags, etc. used throughout the plant. A nominal allowance of $100.00 per day has been established for this factor based on quantities of refuse produced and estimated numbers of containers. A summary of the estimated annual and daily expenses of the system based on the foregoing data is shown in Table II-14, which also relates these costs to the various components of the waste system.

TABLE II-14 DISTRIBUTION OF ESTIMATED ANNUAL COSTS TO WASTE SYSTEM COMPONENTS

| Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Inter-Building | Off-Site | Total | | Avg. Cost Per Day |
| | | | | | Cost | % | |
| Bldg. & Fixed Equip. | $ -0- | $ 21,500 | $ 1,500 | $ -0- | $ 23,000 | 1.0 | $ 63 |
| Maint. & Repairs | -0- | 6,880 | 520 | -0- | 7,400 | 0.3 | $ 20 |
| Vehicular Equip. Carts | -0- | -0- | 4,225 | 5,200 | 9,425 | 0.4 | $ 26 |
| Oper. & Maint. | -0- | -0- | 11,125 | 18,000 | 29,125 | 1.2 | $ 80 |
| Disposal Fees | -0- | -0- | -0- | 16,400 | 16,400 | 0.7 | $ 45 |
| Misc. Expend. Supplies | 12,250 | 12,250 | 12,000 | -0- | 36,500 | 1.5 | $ 100 |
| SUB-TOTAL | $ 12,250 | $ 40,630 | $ 29,370 | $ 39,600 | $ 121,850 | 5.1 | $ 334 |
| Labor (Taxes, Ins., Benefits) | 1,805,000 | 298,000 | 73,000 | 99,000 | $2,275,000 | 94.9 | $6,232 |
| TOTAL | $1,817,250 | $338,630 | $102,370 | $138,600 | $2,396,850 | -- | -- |
| Avg. Cost Per Day | $ 4,980 | $ 926 | $ 280 | $ 380 | $ -- | -- | $6,566 |
| % of Total | 75.8% | 14.1% | 4.3% | 5.8% | -- | 100.0% | -- |

Collectively all costs of equipment, buildings, etc., exclusive of labor, are slightly more than 5% of the total annual costs of the waste system. It is of interest to note that total annual costs of the waste system are equivalent to 2.6% of the total annual operating budget of the Medical Center, which in 1969 was $79,826,000.

Table II-15 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the costs of reprocessing the reusable materials.

TABLE II-15 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| | | Daily Costs of Handling & Disposal | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Avg. Cost | |
| Type of Waste | Avg. Wt. Lbs./Day | Labor | Bldg. & Equip. | *Other | Total | Per Ton | Per Bed |
| Disposables: | | | | | | | |
| Rubbish | 16,200 | $2,235 | $104 | $ 85 | $2,424 | $300 | $1.22 |
| Other | 7,000 | 1,027 | 40 | 60 | 1,127 | 322 | .56 |
| Total | 23,200 | $3,262 | $144 | $145 | $3,551 | $305 | $1.78 |
| Reusables: | | | | | | | |
| Soiled Linen | 45,500 | $1,255 | $ 45 | -- | $1,300 | $ 57 | $0.65 |
| Food Service Items | 9,000 | 1,403 | -- | -- | 1,403 | 312 | .70 |
| Other | TR | 312 | -- | -- | 312 | -- | .15 |
| Total | 54,500 | $2,970 | $ 45 | -- | $3,015 | $110 | $1.50 |
| Total All Materials | 77,700 | $6,232 | $189 | $145 | $6,566 | $170 | $3.28 |

*Miscellaneous expendable supplies and dumping fees

The cost estimates as presented herein are based upon observations and judgments, generally without benefit of record data or statistics. Costs of building areas and equipment as well as hourly rates of labor are based on nominal average unit cost allowances. Waste quantities and manhour estimates, of course, are based on actual observations. Certain extrapolations have been made which by analysis of time (minutes per bed) and costs per bed appear to be reasonable.

The final chapter of this volume will provide cost comparison of solid waste systems in all hospitals under study and the cost "yardstick" to assist in the evaluation of systems.

Alternative methods of waste handling and disposal to be explored in Volume IV of this study will also provide cost comparisons of considered alternatives for the Medical Center system.

## OBSERVATIONS ON AEROSOL CONTAMINATION

Previous research through air and surface sampling has been performed in various hospitals in the country, relating the effects of waste handling activities on the environment and the resulting contamination which may likely occur. Specific investigations by Bond and Michaelsen (Bacterial Contamination from Hospital Solid Wastes - 1964) had given insight into expected effects of waste handling practices on airborne microflora. They had indicated, for instance, that soiled laundry handling was by far the most significant influence on increased airborne bacteria. They also indicated general levels of airborne bacteria associated with various hospital areas and had suggested that such factors as activity levels and ventilation patterns could greatly affect sampling results.

As part of the waste handling evaluation at the Medical Center, it was decided to obtain a limited quantity of data concerning microbiological aerosolization by actually monitoring procedures in several locations specifically selected for their proximity to waste handling activities. The main objective was to demonstrate similar effects to those previously reported, actually occurring in the hospital being studied and to emphasize the potential hazards that exist in these less obvious sources of contamination. Local field experimentation was conducted at the Medical Center in March, 1969. This program was limited to air sampling for quantitative estimates of airborne bacteria at selected locations in the plant. Field testing and lab analysis were performed by personnel of the Los Angeles County Health Department in collaboration with special consultants from the Division of Environmental Health and Safety, School of Public Health, University of Minnesota.

### Equipment and Procedures Used:

The air samplers chosen for the study were Elliot Slit Samplers. These samplers were connected to vacuum pumps and equipped with gauges to regulate airflow to one cubic foot per minute. The samplers operate on the slit impaction principle. Air sampling plates are placed on a turntable adjusted to a distance of 2 mm between the bottom of the slit and the agar surface. Two samplers were employed. One was set for one revolution of the turntable in two minutes (two cubic feet) while the other made one revolution in six minutes (six cubic feet). Prepoured plates containing Trypticase Soy Agar were obtained for the program. Plates were incubated at 37° C for 20-24 hours after sampling, then counted. When plates were too heavily contaminated for accurate counting, results were recorded as TNTC and arbitrarily assigned a value of 200 col/cu ft.

Observations at Selected Sampling Stations:

The areas selected for sampling included the following:

1. Trash chute rooms and the adjacent corridor in the service level of the Acute Unit (Bldg. No. 1) at the Medical Center.

2. Laundry chute rooms and adjacent corridor areas at the same level.

3. The soiled linen sorting area at the laundry.

4. One soiled utility room on an upper story nursing station.

Each of the selected areas was sampled on several occasions. On those days when the chute rooms and adjacent corridors were being sampled, one sampler was set up in the room while the other was located in the corridor near the door, which was kept closed except when entry was necessary. A sample was run on each machine approximately every 15 minutes, starting between 6:30 and 7:30 a.m. and continuing for some 6 to 8 hours. A detailed record of activity associated with each sample was kept. Additional samples were sometimes run directly associated with a specific waste handling activity, such as loading of trash or laundry into carts. Figure II-6 shows the typical arrangement of air sampling equipment during sampling procedures.

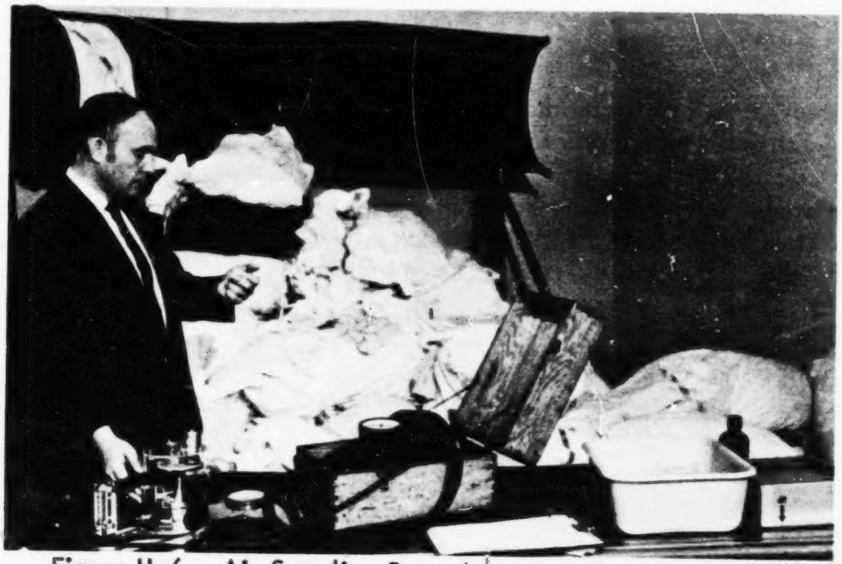


Figure II-6 Air Sampling Procedures in Soiled Linen Room

In the soiled linen sorting area, one machine was set up near the start of the belt operation and the other near the end. Again sequential samples were taken every 15 minutes or so for 4 or 5 hours. On the nursing station the two machines were located on opposite sides of the soiled utility room.

Results of the Sampling Program:

The overall results of the air sampling program are summarized in Table II-16.

TABLE II-16 SUMMARY OF AIR SAMPLING DATA

| Station | | # Observations | Mean col/ cu. ft. | # of TNTC Plates |
|---|---|---|---|---|
| Trash Chute Room | - Inside | 99 | 14.1 | 2 |
| | Outside | 96 | 8.8 | 0 |
| Laundry Chute Room | - Inside | 58 | 38.3 | 2 |
| | - Outside | 57 | 31.4 | 5 |
| Soiled Linen Sorting Area | | 54 | 71.0 | 7 |
| Station Utility Room | | 55 | 5.0 | 0 |

It is obvious that the laundry handling operation does generate considerably greater aerosols than does the trash handling. This is consistent with the conclusions of Bond and Michaelsen. Also of considerable interest is the finding that colony counts in the corridor adjacent to the soiled linen chute rooms were almost as high as in the storage room itself. Thus, it appears that the soiled linen handling operation as currently practiced might actually result in exposing the great number of persons utilizing the adjacent corridor to increased airborne contamination.

It is somewhat surprising that the corridor outside of the soiled linen chute rooms should be significantly more contaminated than the same corridor outside of trash chute rooms, as the trash and soiled linen storage rooms are often in close proximity to each other. One possible explanation might be that the pattern of air movement in the tunnel is from the trash rooms toward the soiled linen rooms.

In summary, the air sampling program has demonstrated, in agreement with previously published reports, that soiled linen handling is a significant source of airborne contaminants and that even when the activity is confined to a storage room with the door closed most of the time, the effect can be demonstrated in adjacent areas.

## EVALUATION OF EXISTING SYSTEM OPERATION

The evaluation of the performance capabilities of the existing solid waste system at the Medical Center has been based upon observations of the plant, equipment and operating techniques employed in its operation. As an aid for evaluation of the system, a summary description of the total solid waste system, Table II-17, was prepared, showing typical daily production of the various types of wastes and the prevailing methods of performing the various function within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site System) for each type of waste.

As indicated in the Table, the task of the movement of waste materials at the Medical Center is largely manual in nature. Although equipment presently employed provides mechanical means of vertical and horizontal transportation over substantial distances for those wastes of the greatest quantities (soiled linen and rubbish, etc.), movement of each of these wastes generally involves a minimum of four different modes of transport, and four to five physical rehandlings or transfers of the loose or contained materials, between the points of initial deposit and their ultimate resting place. An extreme contrast to these methods may be observed in the direct closed system afforded food preparation wastes, which are generally limited to a single handling as they are deposited directly in the kitchen grinders soon after creation.

It is evident that evaluation of the existing systems for handling the various types of waste materials within the complex will, in the majority of cases, depend upon methods of preparation of waste materials and reflect the performance of labor handling this material, working generally without benefit of specialized equipment. Malfunctions of any of the limited equipment in the system will tend to handicap labor further in satisfactorily performing its functions and affect standards throughout the respective waste system.

TABLE II-17

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

LAC-USC MEDICAL CENTER

| | | | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Av. Daily Weight | % of Total | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 75 | .1 | Lined Open Container | Manual | Utility Room | Elevator | Can Room | Cart Train | Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Pathological and Surgical | 1,000 | 1.3 | Lined Closed Container | Manual | Utility Room | Elevator | Can Room | Cart Train | Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Soiled Linen | 45,500 | 58.6 | Cloth Bag | Manual | Corridor | Gravity Chute | Chute Room | Cart Train | Open Storage Area | Laundry | --- | --- |
| Rubbish | 16,200 | 20.9 | Lined Open Container | Hand Cart | Utility Room | Gravity Chute | Chute Room | Cart Train | Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room Autoclave | --- | --- | --- | --- | --- | --- | --- |
| Non-Combustible | 1,500 | 1.8 | Lined Open Container | Manual | Utility Room | Elevator | Can Room | Cart Train | Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Garbage (Non-Grindable) | 1,800 | 2.3 | Special Cart | Special Cart | Corridor | Elevator | Corridor | Cart Train | Special Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Food Service Items | 9,000 | 11.6 | Special Cart | Special Cart | Corridor | Elevator | Corridor | Cart Train | Corridor | Kitchen | --- | --- |
| Radiological | TR | TR | Special Container | Manual | Special Container | Elevator | --- | Hand Cart | Roof Top | --- | Private Contractor | Federal Landfill |
| Ash & Residue | TR | TR | Closed Container | Manual | --- | Stairs | Can Room | Cart Train | Cart | Loading Dock | Hospital Packer Truck | Landfill |
| Animal Carcasses | 25 | TR | Closed Container | Manual | --- | --- | --- | Cart | Refrigerator | --- | City Truck | Rendering |
| Food Waste (Grindable) | 2,600 | 3.4 | Open Container | Manual | Grinder | Sewer | --- | Sewer | --- | --- | Sewer | Sewer Treatment Plant |

The Developed Rating:

In the development and application of evaluation methods adopted for this study, general guidelines were established for rating the various types of equipment and methods employed in each function of the system for handling the respective types of waste. Evaluation of the total system was based on observations over a period of some sixty days, during which various malfunctions in the system occurred. However, the evaluation was based on what appeared to be prevailing practices and conditions during this period. Table II-18 presents the composite deficiency rating as developed by the project staff, and follows the format established in the introductory section in Volume I. Proper interpretation of the rating of individual waste systems will indicate those areas of the system where remedial measures should be considered. It would appear that minimizing rehandling and exposure of all waste materials within the plant by means of a closed transport system, with no interruption between the initial points of dispatch and processing or disposal stations would provide the optimum in solid waste system.

Discussions on remedial measures to be considered as suggested by the deficiency rating of the individual waste systems at the Medical Center are presented in Volume IV.

TABLE II-18

NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

LAC-USC MEDICAL CENTER

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| | | Def Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 30 | 40 | 38 | 50 | 15 | 20 | 83 | 110 | 40 | 50 | 15 | 20 | 55 | 70 | 40 | 50 | 5 | 10 | 20 | 20 | 65 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 293 | 360 |
| | Safety | 30 | 40 | 25 | 50 | 5 | 10 | 60 | 100 | 25 | 45 | 5 | 10 | 30 | 55 | 30 | 45 | 2 | 5 | 10 | 10 | 42 | 60 | 5 | 10 | 75 | 75 | 80 | 85 | 212 | 300 |
| | Security | 15 | 30 | 2 | 5 | 20 | 25 | 37 | 60 | 0 | 5 | 13 | 25 | 13 | 30 | 5 | 5 | 25 | 25 | 10 | 10 | 40 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 150 | 200 |
| | Esthetics | 5 | 5 | 2 | 5 | 2 | 5 | 9 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 2 | 5 | 5 | 5 | 5 | 5 | 12 | 15 | 3 | 5 | 20 | 20 | 23 | 25 | 48 | 65 |
| Surgical, Patho-logical & Animals | Sanitation | 10 | 20 | 15 | 35 | 25 | 35 | 50 | 90 | 15 | 20 | 35 | 35 | 50 | 55 | 5 | 10 | 10 | 10 | 40 | 40 | 55 | 60 | 20 | 20 | 75 | 75 | 95 | 95 | 250 | 300 |
| | Safety | 2 | 5 | 5 | 10 | 2 | 5 | 9 | 20 | 2 | 5 | 7 | 10 | 9 | 15 | 12 | 15 | 10 | 10 | 5 | 5 | 27 | 30 | 5 | 5 | 5 | 5 | 10 | 10 | 55 | 75 |
| | Security | 0 | 5 | 0 | 5 | 35 | 35 | 35 | 45 | 0 | 5 | 25 | 35 | 25 | 40 | 2 | 5 | 20 | 20 | 5 | 5 | 27 | 30 | 2 | 10 | 75 | 75 | 77 | 85 | 164 | 200 |
| | Esthetics | 5 | 10 | 2 | 5 | 11 | 15 | 18 | 30 | 2 | 5 | 11 | 15 | 13 | 20 | 2 | 5 | 15 | 15 | 10 | 10 | 27 | 30 | 5 | 5 | 15 | 15 | 20 | 20 | 78 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | 22 | 30 | 87 | 120 | 40 | 80 | 40 | 50 | 80 | 130 | 25 | 30 | 30 | 30 | 20 | 40 | 75 | 100 | | 10 | | 40 | | 50 | 242 | 400 |
| | Safety | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 5 | 10 | 5 | 5 | 7 | 15 | 17 | 30 | | 5 | | 15 | | 20 | 25 | 75 |
| | Security | 2 | 5 | 2 | 5 | 5 | 5 | 9 | 15 | 0 | 5 | 5 | 15 | 5 | 20 | 7 | 15 | 20 | 20 | 2 | 5 | 29 | 40 | | 15 | | 5 | | 20 | 43 | 95 |
| | Esthetics | 15 | 20 | 10 | 15 | 7 | 10 | 32 | 45 | 5 | 10 | 10 | 10 | 15 | 20 | 5 | 5 | 5 | 5 | 2 | 5 | 12 | 15 | | 5 | | 15 | | 20 | 59 | 100 |
| Rubbish | Sanitation | 2 | 5 | 5 | 10 | 5 | 10 | 12 | 25 | 10 | 20 | 10 | 15 | 20 | 35 | 5 | 10 | 5 | 10 | 15 | 15 | 25 | 35 | 5 | 10 | 40 | 55 | 45 | 65 | 102 | 160 |
| | Safety | 7 | 15 | 10 | 20 | 13 | 25 | 30 | 60 | 0 | 20 | 25 | 45 | 25 | 65 | 7 | 15 | 13 | 25 | 25 | 25 | 45 | 65 | 0 | 10 | 20 | 25 | 20 | 35 | 120 | 225 |
| | Security | 2 | 5 | 2 | 5 | 15 | 20 | 19 | 30 | 0 | 5 | 10 | 15 | 10 | 20 | 2 | 5 | 15 | 15 | 10 | 10 | 27 | 30 | 0 | 15 | 30 | 30 | 30 | 45 | 86 | 125 |
| | Esthetics | 15 | 15 | 7 | 15 | 5 | 10 | 27 | 40 | 0 | 10 | 7 | 10 | 7 | 20 | 5 | 5 | 5 | 5 | 5 | 5 | 15 | 15 | 0 | 10 | 10 | 15 | 10 | 25 | 59 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 10 | 20 | 5 | 25 | 15 | 60 | | 15 | | 15 | | 30 | | 20 | | 10 | | 15 | | 45 | | 10 | | 15 | | 25 | 15 | 160 |
| | Safety | | 15 | 10 | 20 | 0 | 5 | 10 | 40 | | 15 | | 5 | | 20 | | 15 | | 5 | | 15 | | 35 | | 10 | | 15 | | 25 | 10 | 120 |
| | Security | | 15 | 0 | 5 | 7 | 15 | 7 | 35 | | 5 | | 15 | | 20 | | 10 | | 15 | | 15 | | 40 | | 10 | | 15 | | 25 | 7 | 120 |
| | Esthetics | | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 4 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 5 | 10 | 5 | 10 | 12 | 25 | 7 | 15 | 2 | 5 | 9 | 20 | 2 | 5 | 0 | 5 | 3 | 5 | 5 | 15 | 2 | 5 | 30 | 35 | 32 | 40 | 58 | 100 |
| | Safety | 10 | 20 | 5 | 15 | 10 | 20 | 25 | 55 | 7 | 15 | 5 | 20 | 12 | 35 | 5 | 10 | 5 | 10 | 7 | 10 | 17 | 30 | 0 | 5 | 13 | 25 | 13 | 30 | 67 | 150 |
| | Security | 5 | 10 | 0 | 5 | 7 | 15 | 12 | 30 | 0 | 5 | 5 | 10 | 5 | 15 | 5 | 5 | 10 | 10 | 3 | 5 | 18 | 20 | 0 | 5 | 15 | 15 | 15 | 20 | 50 | 85 |
| | Esthetics | 5 | 10 | 2 | 5 | 2 | 5 | 9 | 20 | 2 | 5 | 2 | 5 | 4 | 10 | 5 | 5 | 5 | 5 | 5 | 5 | 15 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 32 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 2 | 5 | 7 | 15 | 11 | 25 | 2 | 5 | 15 | 15 | 17 | 20 | 2 | 5 | 2 | 5 | 15 | 15 | 19 | 25 | 5 | 10 | 11 | 15 | 16 | 25 | 63 | 95 |
| | Safety | 1 | 5 | 2 | 5 | 2 | 5 | 5 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 2 | 5 | 2 | 5 | 5 | 5 | 9 | 15 | 0 | 5 | 7 | 10 | 7 | 15 | 25 | 55 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | 0 | 5 | 5 | 5 | 5 | 10 | 2 | 5 | 5 | 5 | 5 | 5 | 12 | 15 | 0 | 5 | 5 | 5 | 5 | 10 | 24 | 50 |
| | Esthetics | 11 | 15 | 2 | 5 | 7 | 10 | 20 | 30 | 2 | 5 | 10 | 10 | 12 | 15 | 2 | 5 | 10 | 10 | 5 | 5 | 17 | 20 | 0 | 15 | 15 | 20 | 15 | 35 | 64 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | 7 | 10 | 11 | 20 | 2 | 5 | 7 | 10 | 9 | 15 | 2 | 5 | 2 | 5 | 3 | 15 | 7 | 25 | | 5 | | 15 | | 20 | 27 | 80 |
| | Safety | 5 | 10 | 5 | 10 | 7 | 10 | 17 | 30 | 2 | 5 | 7 | 10 | 9 | 15 | 2 | 5 | 2 | 5 | 0 | 10 | 4 | 20 | | 5 | | 10 | | 15 | 30 | 80 |
| | Security | 0 | 5 | 1 | 5 | 5 | 5 | 6 | 15 | 2 | 5 | 5 | 5 | 7 | 10 | 2 | 5 | 5 | 5 | 2 | 5 | 9 | 15 | | 5 | | 5 | | 10 | 22 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 3 | 5 | 7 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 2 | 5 | 5 | 5 | 2 | 5 | 9 | 15 | | 5 | | 5 | | 10 | 20 | 50 |
| Total | Sanitation | 78 | 135 | 112 | 185 | 91 | 155 | 281 | 475 | 116 | 210 | 124 | 165 | 240 | 375 | 81 | 135 | 54 | 85 | 116 | 165 | 251 | 385 | 42 | 90 | 236 | 350 | 278 | 440 | 1050 | 1675 |
| | Safety | 57 | 115 | 64 | 135 | 41 | 85 | 162 | 335 | 38 | 115 | 53 | 110 | 91 | 225 | 63 | 120 | 39 | 70 | 59 | 95 | 161 | 285 | 10 | 55 | 120 | 180 | 130 | 235 | 544 | 1080 |
| | Security | 24 | 80 | 7 | 40 | 96 | 125 | 127 | 245 | 2 | 40 | 68 | 125 | 70 | 165 | 25 | 55 | 100 | 115 | 37 | 60 | 162 | 230 | 2 | 75 | 185 | 210 | 187 | 285 | 546 | 925 |
| | Esthetics | 58 | 85 | 29 | 60 | 39 | 65 | 126 | 210 | 15 | 50 | 44 | 65 | 59 | 115 | 23 | 40 | 50 | 55 | 34 | 45 | 107 | 140 | 10 | 55 | 62 | 130 | 72 | 185 | 364 | 650 |
| TOTAL | | 217 | 415 | 212 | 420 | 267 | 430 | 696 | 1265 | 171 | 415 | 289 | 465 | 460 | 880 | 192 | 350 | 243 | 325 | 246 | 365 | 681 | 1040 | 64 | 275 | 603 | 840 | 667 | 1115 | 2504 | 4300 |

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## CHAP. III LONG BEACH GENERAL HOSPITAL

Page No.

DESCRIPTION OF EXISTING PLANT III-1
  Range of Medical Functions and Specialties III-1
  Plant Services and Population III-2
  Location, Buildings and Land III-3

CHARACTERISTICS OF THE SOLID WASTE SYSTEM III-5
  Types of Waste Materials Generated III-5
  Brief Description of the Total System III-6
  Responsibility of Solid Waste Management III-6

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM III-7
  Handling and Storage of Disposable Waste Materials III-7
  Waste Disposal Practices III-8
  Handling and Storage of Reusable Waste Materials III-8
  Quantities and Types of Disposable Waste Materials III-8
  Quantities and Types of Reusable Waste Materials III-9
  Summary of Total Waste Production III-9
  Equipment, Personnel and Contract Services III-11

OBSERVATIONS OF THE IN-BUILDING SYSTEM III-12
  Handling of Disposable Waste Materials III-12
  Handling of Reusable Waste Materials III-12
  Equipment and Personnel Requirements III-13

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM III-14

EVALUATION OF EXISTING SYSTEM OPERATION III-17
  The Developed Rating III-17

Page No.

## LIST OF TABLES

III-1 Shift Population and Waste Production III-2
III-2 Summary of Daily Waste Production III-10
III-3 Daily Requirements for In-Building Waste Handling III-13
III-4 Estimated Daily Labor Costs of Hospital Solid Waste Systems III-15
III-5 Cost Comparison of Disposable and Reusable Wastes III-16
III-6 Description of Hospital Solid Waste Systems III-18
III-7 Numerical Rating of Hospital Solid Waste Systems III-19

## LIST OF FIGURES

III-1 Site Plan III-4

## DESCRIPTION OF EXISTING PLANT

Long Beach General Hospital may be designated as the Geriatrics Rehabilitation Center within the Los Angeles County Hospital system. It serves as a principal area resource for specialized medical care and rehabilitation for those patients in the geriatric age group. These services are available to the acute units of the County's hospital system and by referral from the community. Long Beach, with a bed capacity of 393 units, operates at about 80% of capacity.

### Range of Medical Functions and Specialties:

Types of medical care are preventive, diagnostic, therapeutic and rehabilitative. Plant facilities provide for inpatient, outpatient and day care and for the present, exclude emergency services. The range of medical care specialties, subspecialties or special categories provided include:

- Psychology
- Speech Pathology
- Pathology - diagnostic
- Radiology - diagnostic
- Medicine
  - Metabolic Diseases
  - Gastroenterology
  - Cardiology
  - Infectious Diseases
  - Respiratory Diseases
  - Vascular Diseases
- Physical Medicine and Rehabilitation
- Clinics
  - Orthopedics
  - Neurology
  - Urology
  - Dermatology
  - Ophthalmology
  - Otolaryngology
  - Dentistry
  - Podiatry
  - Gynecology

This facility provides a level of care ranging from intensive rehabilitation to long-term care.

Plant Services and Population Related to Solid Waste Production:

Plant services maintained at this facility include the Dietary, Transportation, Maintenance and General Services. Custodial, Linen and Housekeeping are classified as functions within General Services. Laundry services are furnished by arrangements with another County hospital (Harbor General).

The Business Office provides all administrative functions required in further support of the plant activities. A nursing staff of 82 and 259 aides (attendants) are involved in the various aspects of patient care functions.

Total plant population at Long Beach, including patients and paid and non-compensated personnel, represent some 1,246 persons. From daily census records and ordinance personnel lists, this population consists of about 302 bed patients (avg. seven-day basis), 654 paid employees and 290 non-compensated workers.

Table III-1 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE III-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday-Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 302 | 302 | 302 | 302 | 302 | 302 |
| Paid Personnel | 260 | 110 | 110 | 220 | 110 | 110 |
| Non-Comp. Personnel | 146 | 96 | 48 | -- | -- | -- |
| Total Est. Population/Shift | 708 | 508 | 460 | 522 | 412 | 412 |
| Avg. Shift & Daily Pop. | 559 | | | 449 | | |
| Rate of Waste Production: | | | | | | |
| % of Daily Production | 43% | 30% | 27% | 38% | 31% | 31% |

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

Location, Buildings and Land

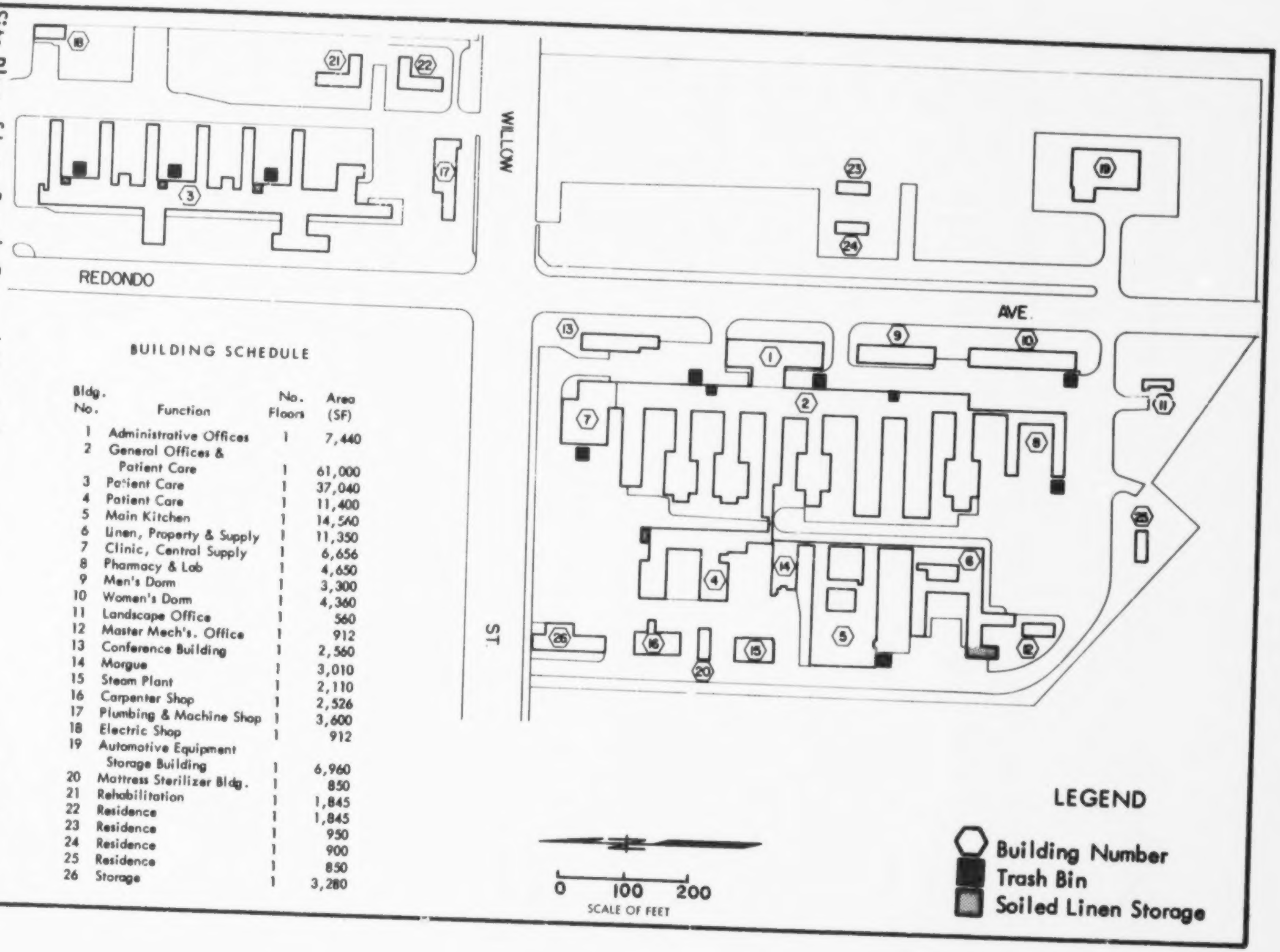
Long Beach General Hospital is located in the South Bay area of Los Angeles County, about 20 miles southeast of the downtown Los Angeles Civic Center. It occupies a gross land area of some 52 acres of relatively flat land divided into two separate parcels by Redondo Avenue.

This facility is comprised of two one-story multiwing ward buildings, together with a complex of one-story service buildings, collectively representing a gross building area of about 195,400 square feet. All buildings are of frame, many interconnected with covered or enclosed corridors.

It is apparent that a continuing reconditioning program is effective, for all the old structures appear to be well maintained. New construction activities at this facility have been limited. However, the addition of a 16,000 square foot clinic and surgery building is planned for the current year at a cost of about $500,000.

The present building complex, together with land, equipment and vehicles, is valued at approximately $6,114,000. Recent program planning studies indicate that if the rehabilitation and geriatric patient load shows a significant increase over the present, future changes to be anticipated at Long Beach will include replacement of existing treatment areas and conversion of some existing patient areas to research, development and training activities.

Figure III-1, the general site plan, identifies the above described parcels and the relationship of buildings within this complex.


WILLOW
ST.
REDONDO
AVE.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
LEGEND
Building Number
Trash Bin
Soiled Linen Storage
0
100
200
SCALE OF FEET

BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Administrative Offices | 1 | 7,440 |
| 2 | General Offices & Patient Care | 1 | 61,000 |
| 3 | Patient Care | 1 | 37,040 |
| 4 | Patient Care | 1 | 11,400 |
| 5 | Main Kitchen | 1 | 14,560 |
| 6 | Linen, Property & Supply | 1 | 11,350 |
| 7 | Clinic, Central Supply | 1 | 6,656 |
| 8 | Pharmacy & Lab | 1 | 4,650 |
| 9 | Men's Dorm | 1 | 3,300 |
| 10 | Women's Dorm | 1 | 4,360 |
| 11 | Landscape Office | 1 | 560 |
| 12 | Master Mech's. Office | 1 | 912 |
| 13 | Conference Building | 1 | 2,560 |
| 14 | Morgue | 1 | 3,010 |
| 15 | Steam Plant | 1 | 2,110 |
| 16 | Carpenter Shop | 1 | 2,526 |
| 17 | Plumbing & Machine Shop | 1 | 3,600 |
| 18 | Electric Shop | 1 | 912 |
| 19 | Automotive Equipment Storage Building | 1 | 6,960 |
| 20 | Mattress Sterilizer Bldg. | 1 | 850 |
| 21 | Rehabilitation | 1 | 1,845 |
| 22 | Residence | 1 | 1,845 |
| 23 | Residence | 1 | 950 |
| 24 | Residence | 1 | 900 |
| 25 | Residence | 1 | 850 |
| 26 | Storage | 1 | 3,280 |

Site Plan of Long Beach General Hospital

FIGURE III-1

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

The uncomplicated physical layout of this facility, the nature of its present use and the ability to function with a relatively low number of workers per bed patient provides conditions for a relatively simple solid waste system.

Types of Waste Materials Generated:

Although the types of patients and range of medical care specialties differ considerably from those of the LAC-USC Medical Center, categories of wastes to be found are generally parallel. These categories resolved for detailed studies are limited to the following:

| | | |
|---|---|---|
| 1. | Sharps, needles, blades, etc. | (Disposable) |
| 2. | Pathological | (Disposable) |
| 3. | Soiled linen | (Reusable) |
| 4. | Rubbish or mixed refuse | (Disposable) |
| 5. | Patient care items | (Reusable) |
| 6. | Non-combustible - glass, metals and ashes | (Disposable) |
| 7. | Garbage (Non-Grindable) | (Disposable) |
| 8. | Food service items | (Reusable) |

These categories basically include garbage, mixed refuse, segregated non-combustibles, special wastes and reusables. At this plant, pathological wastes are to be found in minimal quantities. Reusables, such as soiled linens, will be found in quantities that exceed the combined amounts of conventional disposable wastes.

Brief Description of the Total System:

On-site processing of solid wastes at this facility is limited to grinding of food wastes and pathologic wastes, with transport of the balance of disposable waste materials to landfills. Commencing in the latter part of 1968, services of a private refuse contractor were acquired to furnish necessary on-site storage bins and daily collection with disposal at landfills.

Hand cart collection of materials prevails in the floor activities of these buildings, with initial storage of plastic bagged materials in utility rooms. Custodians transfer this accumulated material to the outside storage bins as required.

Soiled linens are collected in a similar manner. Bagged materials are also stored in utility rooms and then transported by cart to the linen room or loading docks to await truck pickup for delivery to the Harbor General Hospital laundry for processing. Handling of food service equipment is generally confined to the ward service kitchens. Similarly, reusable patient items are generally processed for reuse in the ward utility rooms.

Responsibility of Solid Waste Management:

General Services is charged with the responsibility of solid waste management. This responsibility is limited to on-site handling of soiled linen and all disposable materials except pathologic wastes and disposable syringes and needles. The Transportation Division provides off-site trucking of soiled linen as well as the return of clean linen supplies. Laboratory technicians exclusively handle pathologic wastes. Handling of disposable syringes and needles is generally limited to nurses with final handling by storekeepers in supply. Of course, other classifications of personnel, such as food service workers, nurses aides, etc., are involved in the on-floor handling of reusable materials at the ward level. It is estimated that about 50 employees of various classifications are involved on a part-time basis in handling of solid waste materials in addition to the activities of nurses and nurses' aides.

## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Field observations were conducted during the latter months of 1968 at Long Beach to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

### Handling and Storage of Disposable Waste Materials:

Initial inspections at Long Beach were made to identify the characteristics and functions of the inter-building solid waste system. Figure III-1 illustrates the building layout of this plant. Each of the buildings in this one-story complex represent a potential of one or more accumulation points for both disposable and reusable wastes, with the network of streets and service drives representing the route of the "curbside" collection of these materials.

A building to building type collection service prevailed at the time of the initial observations. Immediately following this observation period, the previously mentioned contractor service for storage bins, collection and hauling was implemented. Intermediate storage locations shown on Figure III-1 illustrate the present methods.

In the present system, custodial personnel collect accumulated wastes (both mixed refuse and segregated non-combustibles) from utility rooms and transport the material to the intermediate storage locations (covered steel bins). These bins of three cubic yard capacity are serviced daily (six days per week) by the commercial hauler, who is equipped with top-loading compactor trucks with forklift loading devices. Minimal litter occurring in the loading area is promptly cleared. At the time of observations, bins were in need of repair. Several covers were bent, broken or missing, hindering closed sanitary storage conditions.

Pathologic wastes are placed in a closed glass container at the point of origin. Collection from utility rooms and disposal of this material is performed exclusively by laboratory technicians. Sharps and needles are also containerized. Needles are snapped from syringes to provide safer handling. Storekeepers collect these containerized materials from utility rooms, transport and deposit them in the commercial bins.

## Waste Disposal Practices:

Throughout the period of observation, all disposable waste materials, with the exception of pathologic wastes and food preparation wastes, were hauled by the hospital truck or the commercial hauler for landfill disposal. The small quantities of pathologic wastes generated at this facility are deposited in the grinder located in autopsy. Food preparation wastes are deposited directly into food grinders at kitchen locations.

## Handling and Storage of Reusable Waste Materials:

Bagged soiled linen stored in utility rooms is collected and transported to central linen storage or loading docks via hand cart. Accumulations of this material at central storage points are transferred to hospital trucks and dispatched to Harbor General Hospital for processing.

Reusable patient items normally will not be found in the inter-building system for they are generally reprocessed in ward utility rooms. Food service items, similarly, are cleaned for reuse in the service kitchens of each ward.

## Quantities and Types of Disposable Waste Materials:

During September, 1968, a quantity survey of solid wastes was made to determine the types and volumes of disposable materials produced daily in the plant. Portable scales were used on the truck collection route. After determination of tare weights of portable containers, scale records were developed on all disposable wastes handled by the hospital truck over a four-day period. During this period, typical activity included the daily servicing of some 25 to 30 collection points. On the average, some 60 containers were handled daily, collectively producing some 768 pounds of disposable wastes. Estimates of pathologic wastes were trace amounts only. Grindable food wastes with the direct disposal in the kitchen were estimated at about 330 pounds.

Collectively, all disposable wastes generated at Long Beach were calculated at about 1,100 pounds daily, or equivalent to about 3.6 pounds per bed patient, or .8 pounds per capita (based on occupancy of 302 and gross population of 1,246).

Quantities and Types of Reusable Waste Materials:

The principal identifiable materials to be found in the system and classified in this study as reusable solid wastes consist of soiled linen and food service items. Total materials processed by the off-site laundry (Harbor General Hospital) average about 116,500 pounds per month, which is equivalent to about 3,740 pounds per day, or about 12.4 pounds per bed patient per day. Reusable food service was estimated at about 1,400 pounds daily based on 1.5 pounds per patient meal.

Summary of Total Waste Production:

In summary, Table III-2 presents the types and quantities of wastes that may be expected to be generated daily at Long Beach General Hospital. The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

TABLE III-2 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors Lbs./Bed Patient | Lbs./Capita |
|---|---|---|---|---|
| Sharps, Needles, Etc. | 3 | .1 | TR | TR |
| Path. & Surgical | TR | TR | TR | TR |
| Soiled Linen | 3,740 | 59.9 | 12.4 | 3.0 |
| Rubbish | 540 | 8.7 | 1.8 | .4 |
| Non-Combustibles | 75 | 1.2 | .2 | TR |
| Garbage (Non-Grindable) | 150 | 2.4 | .5 | .1 |
| Food Service Items | 1,400 | 22.4 | 4.5 | 1.1 |
| Food Waste (Grindable) | 330 | 5.3 | 1.1 | .3 |
| TOTAL WASTES | 6,238 | 100.0 | 20.5 | 5.0 |
| Total Disposable | 1,098 | 17.7 | 3.6 | .8 |
| Total Reusable | 5,140 | 82.3 | 16.9 | 4.2 |

*Based Avg. Census of 302 Bed Patients Daily and Gross Population of 1,246

Note - Total Production Related to Gross Bldg. Area of 195,400 SF:
Disposables @ 5.6 Lbs./MSF, Reusables @ 26.4 Lbs./MSF
or Total of 32.0 Lbs./MSF Daily.

Equipment, Personnel and Contract Services:

Limited hospital equipment and personnel are involved in operation of the inter-building and off-site system. The equivalent of two full time employees accomplish the required daily movements of both disposable wastes and soiled linen. Equipment is limited to hand carts for the collection and movement of disposable wastes and one truck for inter-building collection and off-site transport of soiled linen.

Contractor services for disposable wastes presently in effect include fumishing ten 3 cubic yard closed storage bins, daily collection of accumulated wastes (six days per week), hauling and disposal of these materials in a landfill site. Costs of these services are at a rate of $250 per month and are equivalent to about $1.00 per day per bin. Considering that estimated quantities of about 800 pounds per day or 24,000 pounds per month are handled under this contract, it is of interest to note that costs of about $20 per ton or only slightly more than $0.01 per pound are incurred for this total service.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at Long Beach were made of the functions of the in-building operation (Unit and Inter-Unit System). These observations were directed to the mechanics of handling, handling techniques, equipment used and manpower employed in handling of solid wastes, all in an effort to establish operating standards, efficiencies and a basis of determining costs of the present waste system.

### Handling of Disposable Waste Materials:

Custodians are the principal handlers of disposable waste materials. Wastebaskets and other containers are disinfected daily and lined with plastic bags for reuse. Containers are emptied by removing filled plastic bags and then are deposited in the plastic liner within a suspended cloth bag on the custodial cart. These plastic liners are tied when filled and placed in utility rooms for later collection. Segregated non-combustibles are also collected by custodians and are stored in utility rooms to await collection.

Limited quantities of pathological wastes are immediately placed in identified covered glass containers upon the creation of the waste material. These containers are temporarily stored in utility rooms to await transport to the grinder station for pathologic wastes. Handling of pathologic materials is limited to laboratory technicians.

Disposable syringes and needles, initially handled by nurses, are retained on trays and later placed in covered glass jars in the utility rooms.

Garbage resulting from meal service is collected by food service workers, bagged and stored in service kitchens for later collection by custodians.

### Handling of Reusable Waste Materials:

Nurses generally handle the reusable patient items, transporting them to utility rooms for cleaning. Nurses and attendants collect, bag and store soiled linens in the utility rooms for later collection. After meal service, attendants and food service workers collect reusable food service items by hand cart and return this equipment to the service kitchens for cleaning.

Equipment and Personnel Requirements:

Other than custodial and food service carts, relatively no equipment is utilized or required in this simple system. Transport distances to storage points for the most part are nominal. Personnel requirements appear to be minimal. Observations were made to relate daily manpower requirements to the operation of the in-building system. An equivalent of some 18 mandays was estimated to be required for daily operation. Table III-3, illustrating labor requirements for each type of waste material, was prepared for comparison to other hospitals under study. The composite time factors (minutes per bed) developed from field observations indicate 28.3 minutes per bed patient day is devoted to handling of solid wastes in the in-building system.

TABLE III-3 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| | Manhours by Personnel Classifications | | | | | | |
|---|---|---|---|---|---|---|---|
| Type of Waste | Nurses | Aides | Cust. | (1) Other | Total | Equiv. Man Days | Min. Per Bed |
| Sharps | 1.2 | -- | -- | -- | 1.2 | .1 | .2 |
| Soiled Linen | 3.0 | 52.0 | -- | -- | 55.0 | 6.9 | 10.9 |
| Patient Care Items | 2.5 | -- | -- | -- | 2.5 | .3 | .5 |
| Food Service Items | -- | 31.5 | -- | 16.5 | 48.0 | 6.0 | 9.5 |
| Rubbish | 1.8 | -- | 10.6 | -- | 12.4 | 1.6 | 2.5 |
| Non-Comb. | -- | -- | 3.0 | -- | 3.0 | .4 | .6 |
| Other (2) | -- | -- | -- | 20.6 | 20.6 | 2.6 | 4.1 |
| TOTAL | 8.5 | 83.5 | 13.6 | 37.1 | 142.7 | -- | 28.3 |
| Equivalent Man Days | 1.1 | 10.5 | 1.7 | 4.6 | -- | 17.9 | -- |

(1) Food Service Workers, Lab. Tech.

(2) Pathological, Garbage (Non-Grindable) and Food Waste (Grindable)

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

The foregoing text described the functions of the relatively simple solid waste system at Long Beach and noted the limited equipment and personnel involved in systems operation. The principal costs of operation as found in all hospital systems under study is that of labor. Labor costs for the total system, including payroll taxes, insurance and social benefits, have been calculated at about $206,000 annually, or $564 per calendar day. Table III-4 relates types of employees involved in waste handling and the distribution of estimated daily labor costs to the various types of wastes, as well as the components of the total waste system.

Other readily identifiable cost elements of the system include the contract services for storage bins, collection and disposal at annual costs of about $3,000 or $8.20 daily. Miscellaneous expendables, such as replaceable containers, reusable and disposable bags, etc., as well as the minimal equipment requirements of the system operation, though not significant cost factors, are estimated at a cost of about $40 daily, or $14,600 annually.

Collectively, all estimated costs in the system operation represent some $223,600 annually or $612 daily, with about 85% allocated to costs for the unit system, 10% to the inter-building system, and 5% in the off-site system.

It is of interest to note that collectively all costs exclusive of labor are slightly less than 8% of the total annual costs of the waste system. It is of equal interest to note that total annual costs of the waste system are equivalent to 5.5% of the total annual operating budget in 1969, which was $4,420,000.

TABLE III-4 ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS LONG BEACH GENERAL HOSPITAL

| | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Nurse | $5.72 | 1.2 | $ 6.86 | $ 6.86 | | | | | | Storekpr. | $4.36 | 1.5 | $ 6.54 | $ 6.54 | | | | | | $ 13.40 |
| Pathological and Surgical | Lab. Tech | 4.12 | 0.1 | .41 | .41 | | | | | | Lab.Tech. | 4.12 | 0.4 | 1.65 | 1.65 | | | | | | 2.06 |
| Soiled Linen | Nurse | 5.72 | 3.0 | 17.16 | 190.84 | | | | | | Laund.Wk | 3.25 | 3.0 | 9.75 | 33.99 | Truck Dr. | $4.74 | 1.5 | $7.11 | $7.11 | 231.94 |
| | Attendant | 3.34 | 52.0 | 173.68 | | | | | | | Truck Dr. | 4.74 | 3.0 | 14.22 | | | | | | | |
| | | | | | | | | | | | Custodian | 3.71 | 2.7 | 10.02 | | | | | | | |
| Rubbish | Nurse | 5.72 | 1.8 | 10.30 | 49.63 | | | | | | Custodian | 3.71 | 1.1 | 4.08 | 4.08 | | | | | | 53.71 |
| | Custodian | 3.71 | 10.6 | 39.33 | | | | | | | | | | | | | | | | | |
| Reusable Patient Items | Nurse | 5.72 | 2.5 | 14.30 | 14.30 | | | | | | | | | | | | | | | | 14.30 |
| Non-Combustible | Custodian | 3.71 | 3.0 | 11.13 | 11.13 | | | | | | Custodian | 3.71 | 0.5 | 1.86 | 1.86 | | | | | | 12.99 |
| Garbage (Non-Grindable) | Fd.Srv.Wk | 3.42 | 4.0 | 13.68 | 13.68 | | | | | | Custodian | 3.71 | 1.1 | 4.08 | 4.08 | | | | | | 17.76 |
| Food Service Items | Fd.Srv.Wk | 3.42 | 16.5 | 56.43 | 161.64 | | | | | | | | | | | | | | | | 161.64 |
| | Attendant | 3.34 | 31.5 | 105.21 | | | | | | | | | | | | | | | | | |
| Radiological | | | | | | | | | | | | | | | | | | | | | |
| Ash & Residue | | | | | | | | | | | | | | | | | | | | | |
| Animal Carcasses | | | | | | | | | | | | | | | | | | | | | |
| Food Waste (Grindable) | Fd.Srv.Wk | 3.42 | 16.5 | 56.43 | 56.43 | | | | | | | | | | | | | | | | 56.43 |
| | | | | | $504.92 | | | | | | | | | | $52.20 | | | | | $7.11 | $564.23 |

Table III-5 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the cost of reprocessing the reusable materials.

TABLE III-5 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| Type of Waste | Avg. Wt. Lbs./Day | Daily Costs of Handling & Disposal | | | | | |
|---|---|---|---|---|---|---|---|
| | | Labor | Contract Services | *Other | Total | Avg. Cost Per Ton | Avg. Cost Per Bed |
| Disposables: | | | | | | | |
| Rubbish | 540 | $ 54 | $ 8 | $15 | $ 77 | $286 | $0.25 |
| Other | 558 | 102 | -- | -- | 102 | 366 | .33 |
| Total | 1,098 | $156 | $ 8 | $15 | $179 | $325 | $0.58 |
| Reusables: | | | | | | | |
| Soiled Linen | 3,740 | $232 | -- | $25 | $257 | $137 | $ .85 |
| Food Service Items | 1,400 | 162 | -- | -- | 162 | 232 | .54 |
| Other | TR | 14 | -- | -- | 14 | -- | .05 |
| Total | 5,140 | $408 | -- | $25 | $433 | $168 | $1.44 |
| Total All Materials | 6,238 | $564 | $ 8 | $40 | $612 | $197 | $2.02 |

*Miscellaneous expendable supplies

## EVALUATION OF EXISTING SYSTEM OPERATION

A summary description of the separate solid waste systems employed at Long Beach is shown in Table III-6. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site Systems) for each type of waste.

Examination of this summary indicates that nearly all on-site movement of waste materials is limited to manual methods. In comparison to multistory units, rehandling of materials is somewhat simplified by elimination of vertical transportation requirements. Even so, each material is generally subject to multiple rehandlings between points of generation and ultimate deposit. In evaluation of the existing system, the effectiveness of the preparation of wastes related to sanitation, safety and security during handling and storage was of prime importance. In effect, this evaluation as related to on-site handling is largely an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

### The Developed Rating:

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Table III-7 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this Table will indicate that areas where major deficiencies occur are largely limited to on-site storage facilities and off-site landfill disposal.

TABLE III-6

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

## LONG BEACH GENERAL HOSPITAL

| | | | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Av. Daily Weight | % of Total | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 3 | .1 | Tray | Manual | Jar in Utility Room | --- | --- | Manual | Commercial Bin | --- | Private Packer Truck | Landfill |
| Pathological and Surgical | TR | TR | Glass Jar | Manual | Utility Room | --- | --- | Hand Cart | --- | Grinder | Sewer | Treatment Plant |
| Soiled Linen | 3,740 | 59.9 | Cloth Bag | Manual | Utility Room | --- | --- | Hand Cart | Linen Room | --- | Covered Hospital Truck | Harbor General Hosp. Laundry |
| Rubbish | 540 | 8.7 | Lined Open Container | Hand Cart | Utility Room | --- | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room Autoclave | --- | --- | --- | --- | --- | --- | --- |
| Non-Combustible | 75 | 1.2 | Lined Open Container | Manual | Utility Room | --- | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Garbage (Non-Grindable) | 150 | 2.4 | Lined Container | Manual | Service Kitchen | --- | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Food Service Items | 1,400 | 22.4 | Plastic Trays | Special Cart | Service Kitchen | --- | --- | --- | --- | --- | --- | --- |
| Radiological | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ash & Residue | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Animal Carcasses | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Food Waste (Grindable) | 330 | 5.3 | Open Container | Manual | Grinder | --- | --- | Sewer | --- | --- | Sewer | Sewer Treatment Plant |

TABLE III-7 NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS LONG BEACH GENERAL HOSPITAL

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def Value | Max. Value | Def. Value | Max Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 30 | 40 | 5 | 50 | 10 | 20 | 45 | 110 | | 50 | | 20 | | 70 | 10 | 50 | 10 | 10 | | 20 | 20 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 155 | 360 |
| | Safety | 20 | 40 | 10 | 50 | 5 | 10 | 35 | 100 | | 45 | | 10 | | 55 | 5 | 45 | 2 | 5 | | 10 | 7 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 117 | 300 |
| | Security | 0 | 30 | 0 | 5 | 15 | 25 | 15 | 60 | | 5 | | 25 | | 30 | 0 | 5 | 25 | 25 | | 10 | 25 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 100 | 200 |
| | Esthetics | 5 | 5 | 0 | 5 | 2 | 5 | 7 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 20 | 20 | 20 | 25 | 31 | 65 |
| Surgical, Patho-logical & Animals | Sanitation | 0 | 20 | 0 | 35 | 20 | 35 | 20 | 90 | | 20 | | 35 | | 55 | 0 | 10 | | 10 | 0 | 40 | 0 | 60 | | 20 | | 75 | | 95 | 20 | 300 |
| | Safety | 0 | 5 | 0 | 10 | 2 | 5 | 2 | 20 | | 5 | | 10 | | 15 | 5 | 15 | | 10 | 0 | 5 | 5 | 30 | | 5 | | 5 | | 10 | 7 | 75 |
| | Security | 0 | 5 | 0 | 5 | 20 | 35 | 20 | 45 | | 5 | | 35 | | 40 | 0 | 5 | | 20 | 0 | 5 | 0 | 30 | | 10 | | 75 | | 85 | 20 | 200 |
| | Esthetics | 2 | 10 | 2 | 5 | 5 | 15 | 9 | 30 | | 5 | | 15 | | 20 | 2 | 5 | | 15 | 2 | 10 | 4 | 30 | | 5 | | 15 | | 20 | 13 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | 15 | 30 | 80 | 120 | | 80 | | 50 | | 130 | 15 | 30 | 15 | 30 | | 40 | 30 | 100 | 7 | 10 | 0 | 40 | 7 | 50 | 117 | 400 |
| | Safety | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | | 5 | | 10 | 5 | 10 | 0 | 5 | | 15 | 5 | 30 | 2 | 5 | 0 | 15 | 2 | 20 | 13 | 75 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | | 15 | | 20 | 0 | 15 | 10 | 20 | | 5 | 10 | 40 | 0 | 15 | 0 | 5 | 0 | 20 | 12 | 95 |
| | Esthetics | 15 | 20 | 10 | 15 | 5 | 10 | 30 | 45 | | 10 | | 10 | | 20 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 5 | 15 | 5 | 20 | 39 | 100 |
| Rubbish | Sanitation | 2 | 5 | 0 | 10 | 5 | 10 | 7 | 25 | | 20 | | 15 | | 35 | 5 | 10 | 5 | 10 | | 15 | 10 | 35 | 5 | 10 | 25 | 55 | 30 | 65 | 47 | 160 |
| | Safety | 5 | 15 | 5 | 20 | 10 | 25 | 20 | 60 | | 20 | | 45 | | 65 | 5 | 15 | 10 | 25 | | 25 | 15 | 65 | 0 | 10 | 15 | 25 | 15 | 35 | 50 | 225 |
| | Security | 2 | 5 | 0 | 5 | 10 | 20 | 12 | 30 | | 5 | | 15 | | 20 | 0 | 5 | 15 | 15 | | 10 | 15 | 30 | 0 | 15 | 20 | 30 | 20 | 45 | 47 | 125 |
| | Esthetics | 10 | 15 | 5 | 15 | 5 | 10 | 20 | 40 | | 10 | | 10 | | 20 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 10 | 10 | 15 | 10 | 25 | 34 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 10 | 20 | 5 | 25 | 15 | 60 | | 15 | | 15 | | 30 | | 20 | | 10 | | 15 | | 45 | | 10 | | 15 | | 25 | 15 | 160 |
| | Safety | | 15 | 10 | 20 | 2 | 5 | 12 | 40 | | 15 | | 5 | | 20 | | 15 | | 5 | | 15 | | 35 | | 10 | | 15 | | 25 | 12 | 120 |
| | Security | | 15 | 0 | 5 | 3 | 15 | 3 | 35 | | 5 | | 15 | | 20 | | 10 | | 15 | | 15 | | 40 | | 10 | | 15 | | 25 | 3 | 120 |
| | Esthetics | | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 4 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 0 | 10 | 5 | 10 | 7 | 25 | | 15 | | 5 | | 20 | 0 | 5 | 2 | 5 | | 5 | 2 | 15 | 2 | 5 | 25 | 35 | 27 | 40 | 36 | 100 |
| | Safety | 5 | 20 | 5 | 15 | 10 | 20 | 20 | 55 | | 15 | | 20 | | 35 | 2 | 10 | 5 | 10 | | 10 | 7 | 30 | 0 | 5 | 10 | 25 | 10 | 30 | 37 | 150 |
| | Security | 5 | 10 | 0 | 5 | 5 | 15 | 10 | 30 | | 5 | | 10 | | 15 | 0 | 5 | 10 | 10 | | 5 | 10 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 30 | 85 |
| | Esthetics | 5 | 10 | 2 | 5 | 2 | 5 | 9 | 20 | | 5 | | 5 | | 10 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 15 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 0 | 5 | 5 | 15 | 7 | 25 | | 5 | | 15 | | 20 | 2 | 5 | 2 | 5 | | 15 | 4 | 25 | 5 | 10 | 5 | 15 | 10 | 25 | 21 | 95 |
| | Safety | 0 | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 13 | 55 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 0 | 5 | 2 | 5 | | 5 | 2 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 6 | 50 |
| | Esthetics | 7 | 15 | 2 | 5 | 5 | 10 | 14 | 30 | | 5 | | 10 | | 15 | 2 | 5 | 5 | 10 | | 5 | 7 | 20 | 0 | 15 | 10 | 20 | 10 | 35 | 31 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | 2 | 10 | 6 | 20 | | 5 | | 10 | | 15 | | 5 | | 5 | | 15 | | 25 | | 5 | | 15 | | 20 | 6 | 80 |
| | Safety | 5 | 10 | 5 | 10 | 0 | 10 | 10 | 30 | | 5 | | 10 | | 15 | | 5 | | 5 | | 10 | | 20 | | 5 | | 10 | | 15 | 10 | 80 |
| | Security | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 0 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 6 | 50 |
| Total | Sanitation | 68 | 135 | 52 | 185 | 67 | 155 | 187 | 475 | | 210 | | 165 | | 375 | 32 | 135 | 34 | 85 | 0 | 165 | 66 | 385 | 29 | 90 | 135 | 350 | 164 | 440 | 417 | 1675 |
| | Safety | 37 | 115 | 39 | 135 | 33 | 85 | 109 | 335 | | 115 | | 110 | | 225 | 24 | 120 | 19 | 70 | 0 | 95 | 43 | 285 | 2 | 55 | 105 | 180 | 107 | 235 | 259 | 1080 |
| | Security | 7 | 80 | 0 | 40 | 57 | 125 | 64 | 245 | | 40 | | 125 | | 165 | 0 | 55 | 62 | 115 | 0 | 60 | 62 | 230 | 0 | 75 | 92 | 210 | 92 | 285 | 218 | 925 |
| | Esthetics | 46 | 85 | 25 | 60 | 28 | 65 | 99 | 210 | | 50 | | 65 | | 115 | 12 | 40 | 13 | 55 | 2 | 45 | 27 | 140 | 0 | 55 | 47 | 100 | 47 | 155 | 173 | 620 |
| TOTAL | | 158 | 415 | 116 | 420 | 185 | 430 | 459 | 1265 | | 415 | | 465 | | 880 | 68 | 350 | 128 | 325 | 2 | 365 | 198 | 1040 | 31 | 275 | 379 | 840 | 410 | 1115 | 1067 | 4300 |

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VOL. II OBSERVATIONS OF LOCAL PRACTICES
CHAP. IV HARBOR GENERAL HOSPITAL

Page No.

DESCRIPTION OF EXISTING PLANT IV-1
  Range of Medical Functions and Specialties IV-1
  Plant Services and Population IV-2
  Location, Buildings and Land IV-3

CHARACTERISTICS OF THE SOLID WASTE SYSTEM IV-7
  Types of Waste Materials Generated IV-7
  Brief Description of the Total System IV-8
  Responsibility of Solid Waste Management IV-9
  Organization of Manpower IV-9

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM IV-11
  Handling and Storage of Disposable Waste Materials IV-11
  Waste Disposal Practices IV-13
  Handling and Storage of Reusable Waste Materials IV-14
  Quantities and Types of Disposable Waste Materials IV-14
  Quantities and Types of Reusable Waste Materials IV-15
  Summary of Total Waste Production IV-15
  Equipment and Building Areas Used in System Operation IV-17
  Subcontract Services and Disposal Fees IV-18
  Personnel Requirements IV-18

OBSERVATIONS OF THE IN-BUILDING SYSTEM IV-19
  Handling of Disposable Waste Materials IV-19
  Handling of Reusable Waste Materials IV-20
  Personnel Requirements IV-20
  Equipment and Building Area Requirements IV-22

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM IV-24

EVALUATION OF EXISTING SYSTEM OPERATION IV-31
  The Developed Rating IV-31

VOL. II OBSERVATIONS OF LOCAL PRACTICES
CHAP. IV HARBOR GENERAL HOSPITAL Page No.

## LIST OF TABLES

IV-1 Shift Population and Waste Production IV-3
IV-2 Personnel Assignment to Service Areas IV-10
IV-3 Summary of Daily Waste Production IV-16
IV-4 Costs of Building and Equipment in Inter-Building and Off-Site System IV-17
IV-5 Daily Requirements for In-Building Waste Handling IV-21
IV-6 Labor Requirements of In-Building Waste System IV-22
IV-7 Building Areas and Equipment of the In-Building System IV-23
IV-8 Estimated Annual Equipment Operating Costs IV-24
IV-9 Estimated Daily Labor Costs of Hospital Solid Waste Systems - Unit I IV-26
IV-10 Estimated Daily Labor Costs of Hospital Solid Waste Systems - Unit II IV-27
IV-11 Distribution of Estimated Annual Costs to Waste System Components IV-29
IV-12 Cost Comparison of Disposable and Reusable Wastes IV-30
IV-13 Description of Hospital Solid Waste Systems - Unit I IV-32
IV-14 Description of Hospital Solid Waste Systems - Unit II IV-33
IV-15 Numerical Rating of Hospital Solid Waste Systems - Unit I IV-34
IV-16 Numerical Rating of Hospital Solid Waste Systems - Unit II IV-35

## LIST OF FIGURES

IV-1 Site Plan IV-5
IV-2 Area Photograph of Acute Unit IV-6
IV-3 Schematic of Inter-Building Solid Waste System IV-12

## DESCRIPTION OF EXISTING PLANT

Locally, as well as statewide, Harbor General Hospital ranks second to the LAC-USC Medical Center in number of patients treated annually. Created in the forties and expanded in the early sixties, Harbor today with a licensed bed capacity of 712 serves a population approaching 1,750,000. Harbor General is affiliated with UCLA-Medical School and provides those aspects of the community's total health needs not found in the University's own teaching hospital.

### Range of Medical Functions and Specialties:

Similar medical care functions are provided by Harbor General as provided at the LAC-USC Medical Center. Its teaching and training programs, as well as research activities, also parallel functions at the Medical Center.

Types of care are generally limited to diagnostic and therapeutic functions, except for convalescent care for a limited number of patients with chronic respiratory diseases. Plant facilities provide for inpatient, outpatient and emergency services. A comprehensive range of medical care specialties, subspecialties or special categories are provided, including:

- Anesthesiology
- Pathology
- Radiology
- Psychiatry
- Obstetrics/Gynecology
- Medicine
- Pediatrics
- Surgery
- Physical Medicine and Rehabilitation
- Coronary Care
- Open Heart Surgery
- Center for Communicative Disorders
- Renal Dialysis
- Radiographic Special Procedures
- Intensive Diagnostic Unit
- Oral Surgery and Dentistry
- Clinical Research Center

Plant Services and Population Related to Solid Waste Production:

Present plant services maintained at this facility and staffed by hospital personnel include the Dietary Department, which prepares some 3,600 meals daily with a working staff of approximately 100, the Laundry, which processes some 20,000 pounds of soiled linen daily (including that of other County hospitals) with a working staff of 80, the Housekeeping Division, with a staff of 130, the Mechanical Division, Security and Pharmacy.

The Business Office and Registrar's Division provide those administrative functions required in further support of the plant activities. A nursing staff of 396 and 807 nurses' aides (attendants) are involved in the various aspects of patient care functions.

Total plant population at Harbor General including patients and paid and non-compensated personnel represent some 5,512 persons scheduled over a seven day week, 24 hour day basis. From daily census records and ordinance personnel lists, this population consists of about 541 bed patients (avg. seven day basis), 1,100 out-patients (avg. five day basis), 2,882 paid employees and 989 non-compensated workers.

Table IV-1 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE IV-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 541 | 541 | 541 | 541 | 541 | 541 |
| Outpatients | 1,100 | --- | --- | --- | --- | --- |
| Paid Personnel | 1,100 | 500 | 500 | 1,000 | 500 | 500 |
| Non-Comp. Personnel | 500 | 326 | 163 | --- | --- | --- |
| Total Est. Population/Shift | 3,241 | 1,367 | 1,204 | 1,541 | 1,041 | 1,041 |
| Avg. Shift & Daily Pop. | *1,754 | | | 1,207 | | |
| Rate of Waste Production:<br>% of Daily Production | 52% | 26% | 22% | 42% | 29% | 29% |

*Includes outpatients weighted 1/2 value

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

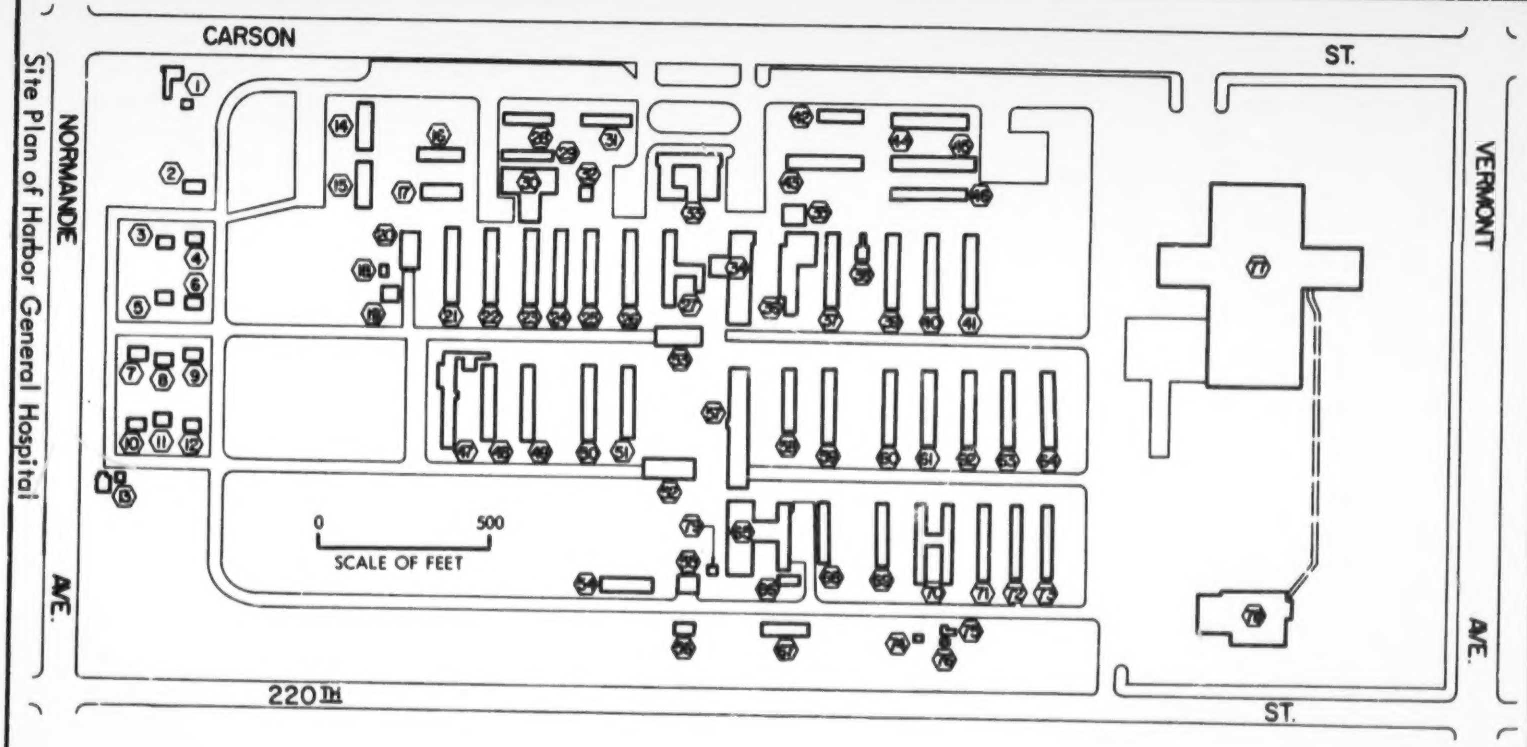
Location, Buildings and Land:

Harbor General Hospital is located in the South Bay area of Los Angeles, about 18 miles south of the downtown Civic Center. It is located on a rectangular plot about 1,200 feet in width on the north-south axis and approximately 2,600 feet in length, representing an area of some 70 acres of relatively flat land.

New construction activities in the early sixties redeveloped the easterly 720 feet, or 20 acres of this property. During this period the existing eight story 430,000 square foot Acute Unit and the two story 16,000 square foot Laundry and Steam Plant were constructed on this parcel together with parking facilities. A complex of 77 one story frame buildings collectively representing a gross building area of about 220,000 square feet occupies the westerly 50 acres of this property.

This building complex, together with land, equipment and vehicles, is valued at approximately $23,100,000. Future expansion of this facility as indicated by the master plan will be westerly from the Acute Unit with planned abandonment of the one story complex.

Figure IV-1, the general site plan, identifies these parcels and buildings by number, function, number of stories, etc. An area photograph, Figure IV-2, indicates the characteristics of the new Acute Unit, the principal building in this complex.

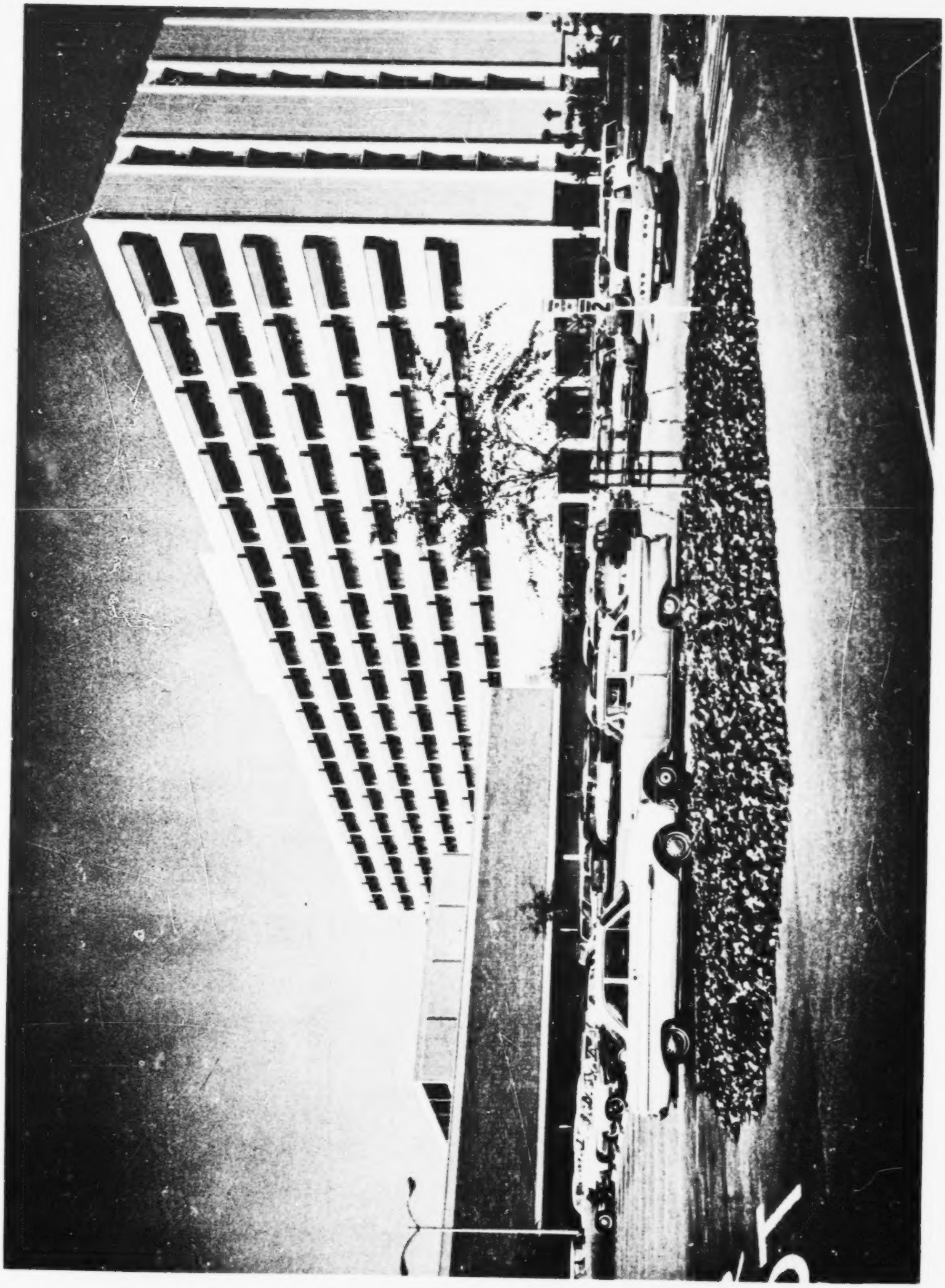


BUILDING SCHEDULE

| Bldg No | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 thru 13 | Residences | 1 | 13,000 | 27,39,40,73 | Medicine | 1 | 17,990 | 54 | Gardening | 1 | 2,600 |
| 14,15,43,44 | Dormitories | 1 | 16,480 | 47 | Pediatrics | 1 | 8,014 | 55,57,65 | Vivarium | 1 | 9,645 |
| 16,72 | School | 1 | 5,091 | 50,58,59 | Obstetrics | 1 | 10,564 | 61,62 | Psychiatry | 1 | 8,840 |
| 17,31,48,49 | Vacant | 1 | 12,574 | 51,53,60 | Research | 1 | 3,875 | 56 | Fire Station | 1 | 2,762 |
| 18,19,52,66,68 | Shops | 1 | 7,964 | 33 | Admin. & Cafeteria | 1 | 9,119 | 67 | Transportation | 1 | 757 |
| 20 | Steam Plant | 1 | 3,000 | 32,42 | Recreation | 1 | 2,317 | 69 | Stockroom | 1 | 4,018 |
| 21 thru 26 | T. B. Ward | 1 | 22,861 | 35,36,46 | Radiology | 1 | 9,770 | 75 | Incinerator | - | - |
| 28,37,45,74,76 | Storage | 1 | 7,420 | 34,70,71 | Surgery | 1 | 20,019 | 77 | Acute Unit | 8 | 431,237 |
| 29 | Custodian | 1 | 2,227 | 38 | Conference Room | 1 | 1,166 | 78 | Laundry & Heating | 2 | 15,840 |
| 30 | Chest Service | 1 | 6,945 | 41,63,64 | Pathology | 1 | 9,672 | 79 | Pathological Incin. | - | - |

Site Plan of Harbor General Hospital

FIGURE IV-1



Area Photograph of Acute Unit

FIGURE IV-2

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

The previous description of the physical layout of this 70 acre plant is indicative of the characteristics that may be expected in its solid waste system. With 77 individual one story buildings comprising more than one-third of the total plant building area and sprawling over fifty acres of land, solid waste system problems typical of a small community are presented in combination with the entirely different system and problems associated with the multistory acute unit occupying a ground floor building area of less than two acres.

### Types of Waste Materials Generated:

As in the other hospital studies incorporated in this report, the eight categories of waste materials resolved for detailed studies are generally limited to the following:

| | |
|---|---|
| 1. Sharps, needles, blades, etc. | (Disposable) |
| 2. Surgical, pathological and animals | (Disposable) |
| 3. Soiled linen | (Reusable) |
| 4. Rubbish or mixed refuse | (Disposable) |
| 5. Patient care items | (Reusable) |
| 6. Non-combustible - glass, metals and ashes | (Disposable) |
| 7. Garbage (Non-Grindable) | (Disposable) |
| 8. Food service items | (Reusable) |

The above categories were established based on the different characteristics of certain waste materials and their respective handling requirements. These categories basically include garbage, mixed refuse, ashes and other segregated non-combustibles, dead animals, special wastes and reusables. At this plant, reusable solid waste materials, such as linens, food service and patient care items, will also be found in quantities that far exceed the amounts of the conventional disposable wastes.

Brief Description of the Total System:

The three conventional methods for disposal of solid wastes generated at this facility include a pathologic incinerator for disposal of tissue wastes, grinder installations for disposal of food preparation wastes and selected pathologic wastes, with the balance of disposable wastes being transported to public landfills for final disposal.

In the one story building complex, inter-building collection of disposable wastes from streetside locations is provided by the 18 cubic yard compactor truck, which proceeds to the County operated landfill (Palos Verdes) as loads are collected. In the multistory building, portable trash bins are manually shuttled from two chute fed intermediate storage rooms within the building to the central storage room adjacent to the loading dock in the service court. These loaded portable bins are intended to be stored at this central accumulation point until discharged into the compactor truck for transport to the landfill.

Soiled linens are also collected by truck from streetside locations in the one-story complex with direct delivery to the laundry-receiving area. In the multistory unit, soiled linens are collected from three chute fed intermediate storage rooms and transported by cart to the laundry-receiving area via the service tunnel connecting these two buildings.

Generally, hand cart collection of materials prevails in the floor activities of each of these buildings. In the case of one story buildings, disposable wastes accumulated in the cart collection are placed in plastic lined cans, which are later transported to the street for truck collection, or on some occasions, the sealed bags are removed and placed along the street. The multistory building is provided with both linen and refuse chutes. Two linen chutes and one trash chute extend the full eight stories for vertical transport of soiled linens and mixed refuse. An additional pair of chutes is located in the two story wing providing vertical transportation for these materials. The balance of waste materials, both reusables and disposables, are transported by elevator to intermediate storage points to await the inter-building truck pickup.

Responsibility of Solid Waste Management:

The Transportation Division and Housekeeping Division jointly are charged with the responsibility of solid waste management. The inter-building collection system and off-site transfer of disposable wastes, together with the on-site inter-building transfer of reusable wastes, is the limit of the responsibility of the Transportation Department. The Housekeeping Division, along with other housekeeping functions, is responsible for the collection and movement of all disposable wastes generated within the plant. In performance of these functions in solid waste management, this division must observe those general regulations dealing with building safety, fire prevention, air pollution, sanitation, as well as the applicable requirements of the Hospital Licensing Act. Performance of the services provided by the Housekeeping Division is facilitated by subdivision of the plant into five basic service areas. These service areas may be physically defined as follows:

Area 1 - the basement level, floors 1, 2 and part of 8 of the Acute Unit;

Area 2 - Floors 3, 4 and 5 of the Acute Unit;

Area 3 - Floors 6, 7 and part of 8 of the Acute Unit;

Area 4 - Special areas including corridors of the Acute Unit;

Area 5 - the one-story building complex.

In addition to these basic service areas in the plant, a sixth area can be identified as the Inter-Building Collection System serviced by the Transportation Division.

Organization of Manpower:

The labor force of the Housekeeping Division is subdivided into teams serving the total plant. These teams provide all services for the specified areas, including on-floor refuse collection activities and transport of segregated material to intermediate storage points. In addition to the Housekeeping Division forces, personnel of the Transportation Division as previously noted are responsible for the inter-building collection services, and personnel of other departments are involved in certain aspects of handling soiled linen and food service items. Nurses' aides or attendants are largely responsible for on-floor handling of reusable materials up to the point of depositing linens in the laundry chutes and placing food service items in the carts for return. Laundry personnel are assigned to clean out soiled linen chute rooms in the Acute Unit, including bagging and placing on soiled linen carts. Dietary personnel, of course, handle cleanup of food carts and food service items on the return to the central kitchen in the Acute Unit.

Each of these service areas are staffed to furnish services as required on a seven-day week basis. Table IV-2 indicates manpower classifications and assignments by both the Transportation Division and Housekeeping Division.

TABLE IV-2 PERSONNEL ASSIGNMENT TO SERVICE AREAS

| Classification | No. of Personnel by Service Areas | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | Total |
| Housekeeping Division: | | | | | | | |
| Custodial Foreman | 1 | 1 | 1 | 1 | 1 | - | 5 |
| Working Foreman | 1 | - | - | - | - | - | 1 |
| Custodians | 26 | 21 | 15 | 22 | 12 | - | 96 |
| Inst. Workers | - | - | 1 | - | 1 | - | 2 |
| Transportation: | | | | | | | |
| Tram Driver (Soiled Linen) | - | - | - | - | - | 2 | 2 |
| Truck Dr. (Refuse) | - | - | - | - | - | 2 | 2 |
| Truck Dr. (Reusables) | - | - | - | - | - | 2 | 2 |
| Total | 28 | 22 | 17 | 23 | 14 | 6 | 110 |

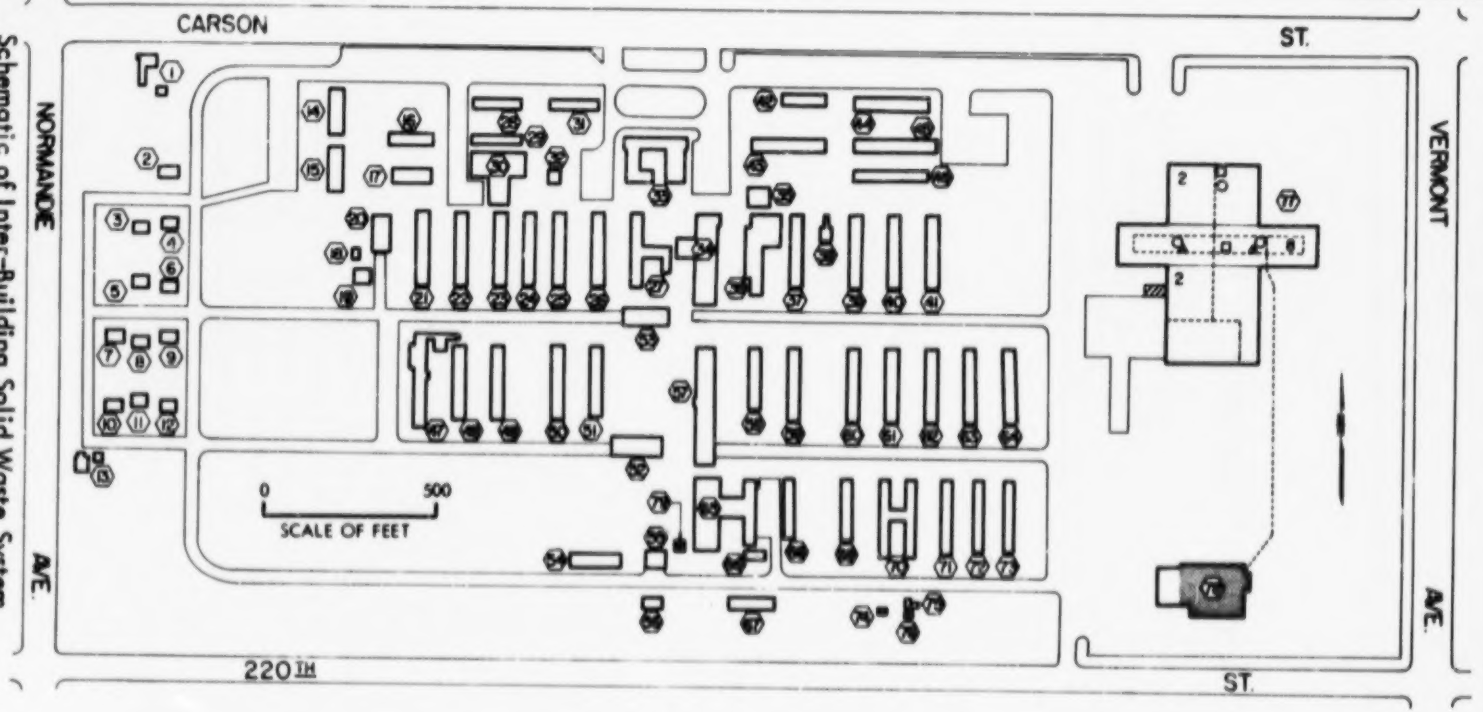
## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Field observations were conducted during the latter months of 1968 at Harbor General to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

### Handling and Storage of Disposable Waste Materials:

Initial inspections at Harbor General were made to identify the characteristics and functions of the inter-building solid waste system. Figure IV-3 illustrates the building layout of this plant and shows the location of intermediate and central solid waste storage points in the Acute Unit as well as the corridor and tunnel network serving this system. Each of the buildings in the one-story complex represent a potential of one or more accumulation points for both disposable and reusable wastes, with the network of streets and service drives representing the route of the "curbside" collection of these materials.

Open top portable trash bins of about 1 2/3 cubic yard capacity used in the intermediate trash rooms (Acute Unit) receive direct discharge of bagged and loose materials from the chutes. As in other hospitals, reusable materials occasionally appearing in the system are segregated and rechanneled to their proper destination. Overflow material in loading of bins is cleaned from the floors, and the loaded bins are manually rolled via the corridors and loading dock to the central storage area. At peak periods during the collection operation, bins are emptied on the floor of the central storage room and returned for reloading. This mixed refuse of variable liquid content is later (upon the arrival of the rear-loading packer truck) pushed off the floor into the truck hopper. Loaded bins are discharged directly into the hopper. An overflow of various materials (solid and liquid) generally occurs during this truck loading operation, with liquids draining across the service court to a catch basin. This service court and loading dock is the principal receiving and shipping point for all types of materials, and also serves as the service entrance for maintenance personnel.



BUILDING SCHEDULE

| Bldg. No | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 thru 13 | Residences | 1 | 13,000 | 27,39,40,73 | Medicine | 1 | 17,990 | 54 | Gardening | 1 | 2,600 |
| 14,15,43,44 | Dormitories | 1 | 16,480 | 47 | Pediatrics | 1 | 8,014 | 55,57,65 | Vivarium | 1 | 9,645 |
| 16,72 | School | 1 | 5,091 | 50,58,59 | Obstetrics | 1 | 10,564 | 61,62 | Psychiatry | 1 | 8,840 |
| 17,31,48,49 | Vacant | 1 | 12,574 | 51,53,60 | Research | 1 | 3,875 | 56 | Fire Station | 1 | 2,762 |
| 18,19,52,66,68 | Shops | 1 | 7,964 | 33 | Admin. & Cafeteria | 1 | 9,119 | 67 | Transportation | 1 | 757 |
| 20 | Steam Plant | 1 | 3,000 | 32,42 | Recreation | 1 | 2,317 | 69 | Stockroom | 1 | 4,018 |
| 21 thru 26 | T. B. Ward | 1 | 22,861 | 35,36,46 | Radiology | 1 | 9,770 | 75 | Incinerator | - | - |
| 28,37,45,74,76 | Storage | 1 | 7,420 | 34,70,71 | Surgery | 1 | 20,019 | 77 | Acute Unit | 8 | 431,237 |
| 29 | Custodian | 1 | 2,227 | 38 | Conference Room | 1 | 1,166 | 78 | Laundry & Heating | 2 | 15,840 |
| 30 | Chest Service | 1 | 6,945 | 41,63,64 | Pathology | 1 | 9,672 | 79 | Pathological Incin. | - | - |

LEGEND

○ Building Number
■ Soiled Linen - Central Storage
▨ General Refuse - Central Storage
○ Soiled Linen Room with Chute
□ Trash Room with Chute
● Pathological Incinerator
▲ Vertical Conveyor
---- Tunnel or Corridor

Schematic of Inter-Building Solid Waste System

FIGURE IV-3

Segregated non-combustibles (glass and metals), as well as disposable syringes and needles, collected throughout the Acute Unit are transported manually via hand cart and elevator, and deposited directly in the central storage room where they become intermixed with other materials. Pathologic wastes are handled exclusively by laboratory technicians from points of accumulation and during transport, as well as deposit in the pathologic incinerator. Non-grindable food wastes from the main kitchen are deposited in the standard portable bins and manually rolled across the loading dock to central storage for truck loading.

In the one-story complex, similar segregation and handling of these materials is practiced though quantities are considerably less in most cases. The animal research center located in this complex generates substantial quantities of animal wastes which are also segregated. Carcasses are placed in plastic bags and refrigerated until picked up by County Animal Shelter personnel. Litter is bagged and collected by the packer truck. Plastic bagged mixed refuse, sometimes in cans, is placed on the ground along the streets for pickup by the hospital packer truck.

Waste Disposal Practices:

Throughout the period of observation all disposable waste materials, with the exception of pathologic wastes, animal carcasses, food preparation wastes, and radiological wastes, were hauled by the hospital packer truck to the County operated Palos Verdes sanitary landfill, some five miles to the southwest. Pathologic wastes and some small animal carcasses are deposited in the on-site gas-fired pathologic incinerator for disposal. The incinerator is not equipped with temperature indicators, though from observations of burning and residue quality, reasonable operation is indicated. Food preparation wastes are deposited directly into food grinders at kitchen locations and minimal quantities of fats are stored in a refrigerated garbage room for pickup by local renderers. Radiological wastes stored in approved containers in a locked storage room are collected as required by a local contractor for disposal at approved landfill.

Handling and Storage of Reusable Waste Materials:

In the Acute Unit, soiled linen is generally bagged prior to deposit in chutes. Handling in chute storage rooms involves a certain amount of rebagging of loose materials and separation of extraneous material that has been deposited in the system. After soiled linen carts are loaded, they are manually rolled into the corridors to await pickup by the tram tractor (battery powered unit) for transfer via the connecting tunnel to the laundry-receiving area. Occasional congestion occurs in the Acute Unit at the entrance to the tunnel where loaded clean linen carts are stored and loaded soiled linen carts are assembled for transport to the laundry. Cloth bagged soiled linen is accumulated by buildings in the one-story complex and placed on the ground along the streets for pickup by a hospital truck for direct transfer to the laundry receiving area.

Reusable patient items normally will not be found in the inter-building system for they are generally autoclaved in ward utility rooms. Food service items are returned to the kitchen on the food carts via corridor and elevator within the Acute Unit and via truck from the one-story complex.

Quantities and Types of Disposable Waste Materials:

During October, 1968, a quantity survey of solid wastes was made to determine the types and volumes of disposable materials produced daily in the total plant. Portable scales were used at central storage and on the truck collection route. After determination of tare weights of portable bins and other containers, scale records were developed on all disposable wastes handled by the compactor truck over a five-day period. During this period, typical activity included the daily movement of 25 portable bins each containing an average of about 200 pounds of waste materials, and the collection of 1,070 pounds of miscellaneous segregated materials (garbage, sharps, non-combustibles, etc.), all in the Acute Unit, as well as 88 bags or cans of mixed refuse averaging about 18 pounds each, collected on the truck route serving the one-story complex. Collectively, these materials handled by the compactor truck averaged some 8,100 pounds daily, requiring an average of two trips to the landfill.

Investigations indicated that a daily average of 154 pounds of pathologic materials are handled by the pathologic incinerator, and about 220 pounds of animal carcasses resulting from research activities are placed in refrigerated storage for later incineration or collection for disposal by rendering. Grindable food wastes with direct disposal in the kitchen were estimated at about 950 pounds daily.

Collectively, all disposable wastes generated at Harbor General were calculated at 9,062 pounds daily, or equivalent to about 16.7 pounds per bed patient, or 1.6 pounds per capita (based on occupancy of 541 and gross population of 5,512).

Quantities and Types of Reusable Waste Materials:

The principal identifiable materials to be found in the system and classified in this study as reusable solid wastes consist of soiled linen and food service items. Total materials processed by the on-site laundry average about 585,000 pounds per month, including processing of soiled linen for three other small County facilities. A monthly average in excess of 400,000 pounds of soiled linen is processed for Harbor General alone, which is equivalent to about 13,600 pounds per calendar day. Reusable food service items collected from the wards were estimated at 2,400 pounds daily based on an average factor of 1.5 pounds per patient meal with some 1,600 patient meals served daily.

Summary of Total Waste Production:

In summary, Table IV-3 presents the types and quantities of wastes that may be expected to be generated daily at Harbor General Hospital, both in the Acute Unit (Unit I) and the one-story complex (Unit II). The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

## TABLE IV-3 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. (Lbs./Day) | | | % of Total | *Daily Production | |
|---|---|---|---|---|---|---|
| | Unit I | Unit II | Total | | Lbs. Per Bed Patient | Lbs. Per Capita |
| Sharps, Needles, Etc. | 20 | 2 | 22 | .1 | TR | TR |
| Path. & Surgical | 154 | 2 | 156 | .6 | .3 | TR |
| Soiled Linen | 12,300 | 1,300 | 13,600 | 54.2 | 25.3 | 2.5 |
| Rubbish | 4,980 | 1,589 | 6,569 | 26.2 | 12.1 | 1.2 |
| Reusable Patient Items | TR | TR | TR | TR | TR | TR |
| Non-Combustibles | 450 | 15 | 465 | 1.9 | .9 | .1 |
| Garbage (Non-Grindable) | 600 | 60 | 660 | 2.6 | 1.2 | .1 |
| Food Service Items | 2,200 | 200 | 2,400 | 9.6 | 4.1 | .4 |
| Ash & Residue | -- | 20 | 20 | .1 | TR | TR |
| Animal Carcasses | 5 | 215 | 220 | .9 | .4 | TR |
| Food Waste (Grindable) | 950 | -- | 950 | 3.8 | 1.8 | .2 |
| TOTAL WASTES | 21,659 | 3,403 | 25,062 | 100.0 | 46.3 | 4.5 |
| Total Disposable | 7,159 | 1,903 | 9,062 | 36.2 | 16.7 | 1.6 |
| Total Reusable | 14,500 | 1,500 | 16,000 | 63.8 | 29.6 | 2.9 |

*Based on Census of 541 Bed Patients Daily and Gross Population of 5,512

Note – Total Production Related to Gross Bldg. Area of 665,800 SF: Disposables @ 10.7 Lbs./MSF, Reusables @ 21.8 Lbs./MSF or Total of 32.5 Lbs./MSF Daily.

Equipment and Building Areas Used in System Operation:

For later economic analysis, the principal equipment and building areas used exclusively by the inter-building and off-site system can be identified as (1) the pathologic incinerator, (2) the central trash storage room, (3) portable trash bins, (4) soiled linen carts, and (5) the 18 cubic yard compactor truck. Table IV-4 shows this inventory and cost allowance of each item.

TABLE IV-4 COSTS OF BUILDING AND EQUIPMENT IN INTER-BUILDING AND OFF-SITE SYSTEM

| | | Est. Value |
|---|---|---|
| Inter-Building System: | | |
| Building Areas & Fixed Equipment: | | |
| Central Trash Storage 300 SF @ $20 = | $6,000 | |
| Pathologic Incinerator | 5,000 | |
| Total Building and Fixed Equipment | | $11,000 |
| Equipment: | | |
| 12 - Portable Trash Bins @ $350 = | $4,200 | |
| 15 - Soiled Linen Carts @ 200 = | 3,000 | |
| Total Equipment | | 7,200 |
| Off-Site System: | | |
| 1 - 18 CY Compactor Truck | | 15,000 |
| EST. REPLACEMENT COST OF BUILDINGS AND EQUIPMENT | | $33,200 |

This estimate, based on approximate replacement costs, indicates a capital investment of about $18,200 required to duplicate buildings and equipment used in the inter-building system and $15,000 for transport equipment used in the off-site system.

Subcontract Services and Disposal Fees:

At the time of observation, a standard disposal fee of $1.25 per ton prevailed for those materials delivered to the County landfill. No additional charges were made for special handling of hospital wastes. All loads were classified as rubbish on disposal receipts. Based on average daily volumes of about 4.5 tons, average daily costs of about $5.60 are incurred.

Personnel Requirements:

From field records of the entire period of observation, it is estimated that average daily activity of the inter-building and off-site system involves an equivalent of about 4.2 men. About two-thirds of this manpower is represented by truck and tram operators, with the remainder consisting of institutional laborers, custodians, lab technicians and food service workers involved in the collection and movement of both disposable and reusable waste materials.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at Harbor General were made of the functions of the in-building operation (Unit and Inter-Unit System). These observations were directed to the mechanics of handling, handling techniques associated with all types of wastes, equipment used and time devoted by personnel classifications in various aspects of waste handling, all in an effort to establish prevailing operating standards, efficiencies and a basis of detemining costs of the present waste system operation.

### Handling of Disposable Waste Materials:

Collection and handling of wastebasket contents is perfomed by custodial personnel. Similar conventional methods and equipment are used here as are employed at the LAC-USC Medical Center and other area hospitals. Custodians disinfect and line wastebaskets with plastic bags. Containers are emptied by removing the filled plastic bags which are deposited in a plastic liner within a suspended cloth bag or GI can on the custodial cart. The plastic liners are tied when filled and deposited in the trash chute in the multistory building or placed in a GI can in utility rooms in the one-story buildings.

Pathological wastes are initially placed in plastic lined metal trays or cans and placed in refrigerated storage until transferred to the pathologic incinerator for disposal. Laboratory technicians or autopsy assistants transport this material and deposit it in the incinerator. Frequency of delivery, usually daily, will vary with quantities accumulated.

Segregated collections of sharps, syringes, needles and miscellaneous non-combustibles are assembled in ward utility rooms by nurses and custodians. Usually disposable syringes and needles are placed in cartons. In the one-story complex, these materials are then bagged and placed "curbside" for collection by the packer truck. In the multistory unit they are transported via cart and elevator to the central trash storage room. Segregation is maintained until such time as they are delivered to the central storage room or loaded on the truck for disposal at the landfill.

Handling of food wastes, both grindable and non-grindable, is limited to food service workers, until the materials are either deposited in grinders for disposal or in portable bins for later transfer to the central trash storage room.

Handling of animal carcasses resulting from research activities is limited to the laboratory technicians of the research departments until they are placed either in pathologic incinerators for disposal or refrigerated storage to await collection.

Handling of Reusable Waste Materials:

Reusable waste materials are handled almost exclusively by nurses' aides (attendants) at the ward level. Custodians, food service workers and laundry workers assist in the collection of assembled reusable materials from the wards. In the case of reusable patient items, these materials are generally reprocessed (autoclaved) by the attendant in the ward utility rooms. Soiled linen is bagged and deposited in the linen chute in the multistory building or stored in the ward utility rooms in the one-story complex. Food service items are assembled on the food carts and returned by food service workers to the kitchen for cleaning.

Personnel Requirements:

To relate personnel requirements to performance of the previously described functions within the waste system, various departments were observed and composite time factors were developed. These factors were related to the major types of wastes and were resolved to minutes per day per bed patient in handling each type of material. Projections of total manhour and equivalent manday requirements for the in-building system are summarized in Table IV-5.

## TABLE IV-5 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| | Manhours by Personnel Classifications | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Nurses | Aides | Cust. | Lndry. Wrkrs. | Lab. Tech. | (1) Other | Total | Equiv. Man Days | Min. Per Bed |
| Sharps | 3.9 | -- | 1.8 | -- | .1 | -- | 5.8 | .7 | .6 |
| Soiled Linen | -- | 88.3 | 7.5 | 16.0 | -- | -- | 111.8 | 14.0 | 12.3 |
| Patient Care Items | -- | 5.5 | -- | -- | -- | -- | 5.5 | .7 | .6 |
| Food Service Items | -- | 55.0 | -- | -- | -- | 10.9 | 65.9 | 8.4 | 7.1 |
| Rubbish | -- | 52.5 | 242.4 | -- | -- | -- | 294.9 | 36.8 | 32.6 |
| Non-Comb. | 12.0 | -- | 4.5 | -- | .5 | -- | 17.0 | 2.1 | 1.9 |
| Other (2) | -- | 2.0 | 2.5 | -- | 5.9 | 12.2 | 22.6 | 2.8 | 2.5 |
| TOTAL | 15.9 | 203.3 | 258.7 | 16.0 | 6.5 | 23.1 | 523.5 | 65.5 | 57.6 |
| Equivalent Man Days | 2.0 | 25.5 | 32.4 | 2.0 | .8 | 2.8 | -- | 65.5 | -- |

(1) Food Service Workers, Autopsy Asst., Truck Driver

(2) Pathological, Garbage (Non-Grindable), Radiological, Food Waste (Grindable)

Table IV-6 was prepared to illustrate the manpower load requirements on major personnel classifications involved in the in-building solid waste system. It shows average daily personnel available (7 day basis) and the number and percent required for handling of solid wastes. Further detail on personnel requirements, including labor cost estimates in handling of solid wastes within each of the various components of the system, will be presented at the close of this chapter.

TABLE IV-6 LABOR REQUIREMENTS OF IN-BUILDING WASTE SYSTEM

| Personnel Classification | Man Day Distribution | | |
|---|---|---|---|
| | (1) Total Available | Required for Waste Handling | |
| | | Man Days | % of Total |
| Nurses | 396 | 2.0 | 0.5% |
| Nurses Aides | 807 | 25.5 | 3.2% |
| Custodians | 104 | 32.4 | 31.1% |

(1) 7-Day Basis of Ordinance Positions

Equipment and Building Area Requirements:

Principal building areas and equipment utilized in the in-building waste system are limited to the three soiled linen chute rooms and two trash chute rooms, together with chutes, shaftways and hardware. Collectively, these items represent a capital investment of about $37,000. Table IV-7 shows the breakdown of these costs based on nominal allowances of $25.00 per square foot of building area and $3.00 per cubic foot for shaftways.

TABLE IV-7 BUILDING AREAS AND EQUIPMENT OF THE IN-BUILDING SYSTEM

| | | Est. Value |
|---|---|---|
| Building Areas and Volumes: | | |
| 2 Trash Chute Rooms | 350 SF @ $25/SF | $ 8,750 |
| 3 Soiled Linen Chute Rooms | 700 SF @ $25/SF | 17,500 |
| 280 LF Chute-Shafts @ 6 CF/LF = 1,680 CF @ $3/CF | | 5,040 |
| | Total Building Value Allowance | $31,290 |
| Fixed Equipment: | | |
| 280 LF Trash and Linen Chutes @ $20/LF Installed | | $ 5,600 |
| TOTAL BUILDING AND FIXED EQUIPMENT | | $36,890 |

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

Building, equipment and labor involved in the system operation have been explored in detail in the preceding sections of this chapter. An investment of some $48,000 has been calculated for those portions of the physical plant and fixed equipment that are exclusively used in solid waste handling functions. Projecting the estimated value of buildings and fixed equipment on a thirty-five year basis with a nominal interest rate of 5% (average annual amortization rate at 6.107%) results in an average expense of about $3,060 per year, or $8.40 per calendar day. A reasonable budget allowance for maintenance and repairs of these types of facilities should be equal to about 2% of building costs, or some $960 a year, or $2.60 per day.

Operating cost allowances for vehicular equipment include maintenance and repairs, tires, fuel, service, licenses, etc. as may be required. In the case of the compactor truck, although a low mileage vehicle, it is generally operated at least at idling speed 8 to 10 hours daily on a seven-day basis or about 3,000 operating hours per year. The tram train tractor unit used in the transfer of soiled linen is estimated to be used an average of about three hours per day, or some 1,000 hours per year for this purpose, with the balance of its use allocated to movement of clean supplies. Table IV-8, using these operating factors together with an assumed useful life of 10 years for all equipment, summarizes total annual equipment expenses for the total system at $11,805 or equivalent to about $32.00 per day.

TABLE IV-8 ESTIMATED ANNUAL EQUIPMENT OPERATING COSTS

| Equipment Item | Cost Allowance | Oper. & Maint. Cost | Annual Oper. Cost | Depre-ciation | Total Annual Cost |
|---|---|---|---|---|---|
| 1-18 CY. Comp. Truck | $15,000 | $2.50/Hr. | $7,500 | $1,500 | $ 9,000 |
| 1-*Tram Train Tractor | 3,000 | 1.25/Hr. | 1,250 | 115 | 1,365 |
| 12-Portable Trash Bins | 350 | 10% of Val. | 420 | 420 | 840 |
| 15-Soiled Linen Carts | 200 | 10% of Val. | 300 | 300 | 600 |
| TOTAL EQUIPMENT | | | $9,470 | $2,335 | $11,805 |

*Prorated Depreciation – 38% of Use Allocated to Solid Waste Handling

In addition to the foregoing costs, labor for the total system, including payroll taxes, insurance and social benefits, has been calculated at about $745,000 annually or $2,040 per calendar day. Tables IV-9 and IV-10 relate types of employees involved in waste handling and the distribution of estimated labor cost to the various types of wastes (reusables and disposables), as well as the components of the total waste system in both the Acute Unit (Unit I) and the one-story complex (Unit II).

TABLE IV-9 ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS HARBOR GENERAL HOSPITAL - UNIT I

|  | Unit System |  |  |  |  | Inter-Unit System |  |  |  |  | Inter-Building System |  |  |  |  | Off-Site System |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Nurse | $5.72 | 3.0 | $ 17.16 | $ 19.76 | Custodian | $3.71 | 0.7 | $ 2.60 | $ 2.60 | Custodian | $3.71 | 0.7 | $ 2.60 | $ 2.60 | Truck Dr. | $4.74 | 0.1 | $ 0.47 | $ 0.47 | $ 25.43 |
|  | Custodian | 3.71 | 0.7 | 2.60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pathological and Surgical | Autopsy Asst. | 4.23 | 1.0 | 4.23 | 8.35 | Autopsy Asst. | 4.23 | 0.25 | 1.06 | 3.28 | Autopsy Asst. | 4.23 | 0.5 | 2.12 | 3.31 |  |  |  |  |  | 14.94 |
|  | Lab.Tech. | 4.12 | 1.0 | 4.12 |  | Lab.Tech. | 4.12 | 0.25 | 1.03 |  | Truck Dr. | 4.74 | 0.25 | 1.19 |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Truck Dr. | 4.74 | 0.25 | 1.19 |  |  |  |  |  |  |  |  |  |  |  |  |
| Soiled Linen | Attendant | 3.34 | 85.0 | 283.90 | 306.16 | Laund.Wk | 3.25 | 16.0 | 52.00 | 52.00 | Tram Dr. | 4.03 | 2.0 | 8.06 | 8.06 |  |  |  |  |  | 366.22 |
|  | Custodian | 3.71 | 6.0 | 22.26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Rubbish | Attendant | 3.34 | 47.5 | 158.65 | 878.39 | Inst. Lab. | 4.03 | 1.0 | 4.03 | 4.03 | Inst. Lab. | 4.03 | 7.0 | 28.21 | 28.21 | Truck Dr. | 4.74 | 10.7 | 50.72 | 50.72 | 961.35 |
|  | Custodian | 3.71 | [illegible]4.0 | 719.74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Reusable Patient Items | Attendant | 3.34 | 5.0 | 16.70 | 16.70 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16.70 |
| Non-Combustible | Nurse | 5.72 | 12.0 | 68.64 | 76.43 | Custodian | 3.71 | 1.4 | 5.19 | 5.19 | Custodian | 3.71 | 0.[illegible] | 0.74 | 0.74 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | 82.83 |
|  | Custodian | 3.71 | 2.1 | 7.79 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Garbage (Non-Grindable) | Fd.Srv.Wk | 3.42 | 4.0 | 13.68 | 13.68 |  |  |  |  |  | Fd.Srv.Wk | 3.42 | 1.0 | 3.42 | 3.42 | Truck Dr. | 4.74 | 1.1 | 5.21 | 5.21 | 22.31 |
| Food Service Items | Attendant | 3.34 | 50.0 | 167.00 | 184.10 | Fd.Srv.Wk | 3.42 | 5.0 | 17.10 | 17.10 |  |  |  |  |  |  |  |  |  |  | 201.20 |
|  | Fd.Srv.Wk | 3.42 | 5.0 | 17.10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Radiological | Lab.Tech. | 4.12 | 1.0 | 4.12 | 4.12 | Lab.Tech. | 4.12 | 0.5 | 2.06 | 2.06 | Lab.Tech. | 4.12 | 0.5 | 2.06 | 2.06 |  |  |  |  |  | 8.24 |
| Ash & Residue |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Animal Carcasses | Lab.Tech. | 4.12 | 0.25 | 1.03 | 1.03 | Lab. Tech. | 4.12 | 0.1 | 0.41 | 0.41 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.89 |  |  |  |  |  | 2.33 |
|  |  |  |  |  |  |  |  |  |  |  | Autopsy Asst. | 4.23 | 0.1 | 0.42 |  |  |  |  |  |  |  |
| Food Waste (Grindable) | Fd.Srv.Wk | 3.42 | 8.0 | 27.36 | 27.36 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 27.36 |
|  |  |  |  |  | $1536.08 |  |  |  |  | $86.67 |  |  |  |  | $49.29 |  |  |  |  | $ 56.87 | $ 1728.91 |

TABLE IV-10

ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

HARBOR GENERAL HOSPITAL - UNIT II

| | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Nurse | $5.72 | 0.9 | $ 5.15 | $ 6.30 | Custodian | $3.71 | 0.2 | $ 0.74 | $ 0.74 | Truck Dr. | $4.74 | 0.1 | $ 0.47 | $ 0.47 | Truck Dr. | $4.74 | 0.1 | $ 0.47 | $ 0.47 | $ 7.98 |
| | Lab. Tech. | 4.12 | 0.1 | .41 | | | | | | | | | | | | | | | | | |
| | Custodian | 3.71 | 0.2 | .74 | | | | | | | | | | | | | | | | | |
| Pathological and Surgical | Lab Tech. | 4.12 | 0.25 | 1.03 | 1.03 | | | | | | Lab Tech. | 4.12 | 0.50 | 2.06 | 2.06 | | | | | | 3.09 |
| Soiled Linen | Attendant | 3.34 | 3.3 | 11.02 | 12.87 | Custodian | 3.71 | 1.0 | 3.71 | 3.71 | Truck Dr. | 4.74 | 2.0 | 9.48 | 9.48 | | | | | | 26.06 |
| | Custodian | 3.71 | 0.5 | 1.85 | | | | | | | | | | | | | | | | | |
| Rubbish | Attendant | 3.34 | 5.0 | 16.70 | 185.13 | Custodian | 3.71 | 2.0 | 7.42 | 7.42 | Truck Dr. | 4.74 | 1.1 | 6.16 | 6.16 | Truck Dr. | 4.74 | 0.5 | 3.32 | 3.32 | 202.03 |
| | Custodian | 3.71 | 45.4 | 168.43 | | | | | | | | | | | | | | | | | |
| Reusable Patient Items | Attendant | 3.34 | 0.5 | 1.67 | 1.67 | | | | | | | | | | | | | | | | 1.67 |
| Non-Combustible | Lab Tech. | 4.12 | 0.5 | 2.06 | 3.91 | Custodian | 3.71 | 0.5 | 1.85 | 1.85 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | Truck Dr. | 4.74 | 0.2 | 0.94 | 0.94 | 7.17 |
| | Custodian | 3.71 | 0.5 | 1.85 | | | | | | | | | | | | | | | | | |
| Garbage (Non-Grindable) | Attendant | 3.34 | 2.0 | 6.68 | 10.39 | Custodian | 3.71 | 1.5 | 5.57 | 5.57 | Truck Dr. | 4.74 | 0.2 | 0.95 | 0.95 | Truck Dr. | 4.74 | 0.2 | 0.95 | 0.95 | 17.86 |
| | Custodian | 3.71 | 1.0 | 3.71 | | | | | | | | | | | | | | | | | |
| Food Service Items | Attendant | 3.34 | 5.0 | 16.70 | 19.78 | | | | | | Truck Dr. | 4.74 | 3.0 | 14.22 | 14.22 | | | | | | 34.00 |
| | Fd.Srv.Wk | 3.42 | 0.9 | 3.08 | | | | | | | | | | | | | | | | | |
| Radiological | Lab.Tech. | 4.12 | 0.25 | 1.03 | 1.03 | | | | | | Lab.Tech. | 4.12 | 0.50 | 2.06 | 2.06 | | | | | | 3.09 |
| Ash & Residue | Autopsy Asst. | 4.23 | 0.5 | 2.16 | 2.16 | | | | | | Truck Dr. | 4.74 | 0.5 | 2.37 | 2.37 | Truck Dr. | 4.74 | 0.5 | 2.37 | 2.37 | 6.90 |
| Animal Carcasses | Lab. Tech | 4.12 | 0.5 | 2.06 | 2.06 | | | | | | | | | | | | | | | | 2.06 |
| Food Waste (Grindable) | | | | | | | | | | | | | | | | | | | | | |
| | | | | | $246.33 | | | | | $ 19.29 | | | | | $ 38.24 | | | | | $ 8.05 | $311.91 |

Certain other operating costs lie in the area of miscellaneous expendables, such as replaceable containers, reusable and disposable bags, etc. used throughout the system. A nominal allowance of $40.00 per day has been established for this factor based on quantities and types of refuse produced and estimated number of containers. A summary of the estimated annual and daily expenses of the system based on the foregoing data is shown in Table IV-11, which also relates these costs to the various components of the waste system.

TABLE IV-11 DISTRIBUTION OF ESTIMATED ANNUAL COSTS TO WASTE SYSTEM COMPONENTS

| Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Inter-Building | Off-Site | Total | | Avg. Cost Per Day |
| | | | | | Cost | % | |
| Bldg. & Fixed Equip. | $ -0- | $ 2,300 | $ 760 | $ -0- | $ 3,060 | .4 | $ 8.40 |
| Maint. & Repairs | -0- | 740 | 220 | -0- | 960 | .1 | 2.60 |
| Vehicular Equip. Carts | -0- | -0- | 835 | 1,500 | 2,335 | .3 | 6.40 |
| Oper. & Maint. | -0- | -0- | 1,970 | 7,500 | 9,470 | 1.2 | 25.90 |
| Disposal Fees | -0- | -0- | -0- | 2,010 | 2,010 | .3 | 5.50 |
| Misc. Expend. Supplies | 5,000 | 5,000 | 4,600 | -0- | 14,600 | 1.9 | 40.00 |
| SUB-TOTAL | $ 5,000 | $ 8,040 | $ 8,385 | $11,010 | $ 32,435 | 4.2 | 88.80 |
| Labor (Taxes, Ins., Benefits) | 651,000 | 39,000 | 32,000 | 23,000 | 745,000 | 95.8 | $2,040.00 |
| TOTAL | $656,000 | $47,040 | $40,385 | $34,010 | $777,435 | -- | -- |
| Avg. Cost Per Day | $ 1,797 | $ 128 | $ 110 | $ 93 | $ -- | -- | $2,128.00 |
| % of Total | 84.4% | 6.0% | 5.2% | 4.4% | -- | 100.0% | -- |

Collectively, all costs, including equipment, buildings, etc., exclusive of labor, are only slightly more than 4% of the total annual costs of the waste system. It is of interest to note that total annual costs of the waste system are equivalent to 3.7% of the total annual operating budget of Harbor General, which in 1969 was $21,039,000.

Table IV-12 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the cost of reprocessing the reusable materials.

TABLE IV-12 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| | | Daily Costs of Handling & Disposal | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Avg. Cost | |
| Type of Waste | Avg. Wt. Lbs./Day | Labor | Bldg. & Equip. | *Other | Total | Per Ton | Per Bed |
| Disposables: | | | | | | | |
| Rubbish | 6,569 | $1,163 | $24 | $34 | $1,221 | $372 | $2.26 |
| Other | 2,493 | 233 | 9 | 12 | 254 | 204 | .47 |
| Total | 9,062 | $1,396 | $33 | $46 | $1,475 | $327 | $2.73 |
| Reusables: | | | | | | | |
| Soiled Linen | 13,600 | $ 392 | $10 | -- | $ 402 | $ 58 | $ .74 |
| Food Service Items | 2,400 | 235 | -- | -- | 235 | 196 | .44 |
| Other | TR | 17 | -- | -- | 17 | -- | .03 |
| Total | 16,000 | $ 644 | $10 | -- | $ 654 | $ 82 | $1.21 |
| Total All Materials | 25,062 | $2,040 | $43 | $46 | $2,129 | $170 | $3.94 |

*Miscellaneous expendable supplies and dumping fees

# EVALUATION OF EXISTING SYSTEM OPERATION

Summary descriptions of the separate solid waste systems employed in the Acute Unit (Unit I) and the one-story complex (Unit II) are shown in Tables IV-13 and IV-14. These Tables show typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site Systems) for each type of waste.

Examination of these summaries indicates vertical and horizontal movement of portions of the waste materials is accomplished by mechanical means. However, multiple handlings of each material generally prevails in manual loading, unloading, and reloading functions between points of generation and ultimate deposit. Evaluation of the existing systems will necessarily consider the effectiveness of the preparation of wastes related to sanitation, safety and security during handling operations. In the majority of cases, this will reflect on the performance of labor working generally with limited specialized equipment.

## The Developed Rating:

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Tables IV-15 and IV-16 present the composite deficiency rating on the systems in Unit I and Unit II, as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered.

TABLE IV-13

DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

HARBOR GENERAL HOSPITAL - UNIT I

| | | | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Av. Daily Weight | % of Total | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 20 | .1 | Open Metal Tray | Hand Cart | Utility Room | Elevator | --- | Hand Cart | Trash Room (Loading Dock) | --- | Hospital Truck | County Landfill |
| Pathological and Surgical | 154 | .7 | Lined Plastic Tray | Manual | Refrigerator | Elevator | --- | Hand Cart | --- | *Pathological Incinerator | --- | --- |
| Soiled Linen | 12,300 | 56.8 | Cloth Bag | Manual | Hallway Near Chute | Chute | Soiled Linen Room | Tram | Laundry Sorting Area | Laundry | --- | --- |
| Rubbish | 4,980 | 23.1 | Open Lined Can | Manual | --- | Chute | Chute Room (Basement) | Trash Bin | Trash Room | --- | Hospital Truck | County Landfill |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room Autoclave | --- | --- | --- | --- | --- | --- | --- |
| Non-Combustible | 450 | 2.1 | Open Metal Tray | Hand Cart | Utility Room | Elevator | --- | Hand Cart | Trash Room (Loading Dock) | --- | Hospital Truck | County Landfill |
| Garbage (Non-Grindable) | 600 | 2.8 | Open Can | Manual | Trash Bin | --- | --- | Trash Bin | Trash Room | --- | Hospital Packer Truck | County Landfill |
| Food Service Items | 2,200 | 10.2 | Plastic Trays | Special Cart | Corridor | Elevator | Corridor | Hand Cart | --- | Kitchen | --- | --- |
| Radiological | TR | TR | Lined Metal Can | Manual | Lined Storage Area | Elevator | Locked Storage Room | Hand Cart | Locked Storage Room | --- | Private Truck | Federal Landfill |
| Ash & Residue | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Animal Carcasses | 5 | .1 | Closed Lined Container | Manual | Corridor Near Elevator | Elevator | --- | Hospital Vehicle | --- | Pathological Incinerator | --- | --- |
| Food Waste (Grindable) | 950 | 4.1 | Open Can | Manual | Grinder | --- | --- | --- | --- | --- | Sewer | Sewer Treatment Plant |

*Located in Unit II

TABLE IV-14

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

HARBOR GENERAL HOSPITAL - UNIT II

| Type of Waste | Av. Daily Weight | % of Total | Unit System |  |  | Inter-Unit System |  | Inter-Building System |  |  | Off-Site System |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 2 | .1 | Lined Open Can | Manual | Utility Room | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | County Landfill |
| Pathological and Surgical | 2 | .1 | Closed Lined Metal Can | Manual | Refrigerator | --- | --- | Hand Cart | --- | Pathological Incinerator | --- | --- |
| Soiled Linen | 1,300 | 38.2 | Cloth Bag | Manual | Utility Room | --- | Curbside | Hospital Truck | Laundry Storage Room | Laundry | --- | --- |
| Rubbish | 1,589 | 46.6 | Lined Can | Hand Cart | Utility Room | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | County Landfill |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room Autoclave | --- | --- | --- | --- | --- | --- | --- |
| Non-Combustible | 15 | .4 | Lined Can | Hand Cart | Utility Room | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | County Landfill |
| Garbage (Non-Grindable) | 60 | 1.8 | Lined Can | Hand Cart | Utility Room | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | County Landfill |
| Food Service Items | 200 | 5.9 | Plastic Tray | Special Cart | Curbside | --- | --- | Hospital Truck | --- | Kitchen | --- | --- |
| Radiological | TR | TR | Lined Metal Can | Manual | Storage Room | --- | --- | Hand Cart | Locked Storage Room | --- | Private Truck | Federal Landfill |
| Ash & Residue | 20 | .6 | Metal Can | Manual | Curbside | --- | --- | Hospital Truck | --- | --- | Hospital Truck | County Landfill |
| Animal Carcasses | 215 | 6.3 | Plastic Bag | Manual | Walk-In Freezer | --- | --- | --- | --- | --- | County Pound Truck | Animal Shelter |
| Food Waste (Grindable) | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

TABLE IV-15

## NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

HARBOR GENERAL HOSPITAL - UNIT I

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | | | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | | | Internal Transfer | | Central Storage | | Central Processing or Disposal | | | | External Transfer | | Final Processing and/or Disposal | | | | | |
| | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value Total | Max. Value Total | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value Total | Max. Value Total | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value Total | Max. Value Total | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| Sharps, Needles, Etc. | Sanitation | 30 | 40 | 38 | 50 | 15 | 20 | 83 | 110 | 35 | 50 | | 20 | 35 | 70 | 38 | 50 | 7 | 10 | | 20 | 45 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 253 | 360 |
| | Safety | 20 | 40 | 25 | 50 | 5 | 10 | 50 | 100 | 33 | 45 | | 10 | 33 | 55 | 10 | 45 | 5 | 5 | | 10 | 15 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 173 | 300 |
| | Security | 15 | 30 | 0 | 5 | 20 | 25 | 35 | 60 | 0 | 5 | | 25 | 0 | 30 | 0 | 5 | 25 | 25 | | 10 | 25 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 120 | 200 |
| | Esthetics | 5 | 5 | 2 | 5 | 2 | 5 | 9 | 15 | 2 | 5 | | 5 | 2 | 10 | 2 | 5 | 5 | 5 | | 5 | 7 | 15 | 2 | 5 | 20 | 20 | 22 | 25 | 40 | 65 |
| Surgical, Patho-logical & Animals | Sanitation | 15 | 20 | 15 | 35 | 0 | 35 | 30 | 90 | 10 | 20 | | 35 | 10 | 55 | 5 | 10 | | 10 | 0 | 40 | 5 | 60 | | 20 | | 75 | | 95 | 45 | 300 |
| | Safety | 2 | 5 | 0 | 10 | 0 | 5 | 2 | 20 | 2 | 5 | | 10 | 2 | 15 | 7 | 15 | | 10 | 0 | 5 | 7 | 30 | | 5 | | 5 | | 10 | 11 | 75 |
| | Security | 0 | 5 | 0 | 5 | 0 | 35 | 0 | 45 | 0 | 5 | | 35 | 0 | 40 | 0 | 5 | | 20 | 0 | 5 | 0 | 30 | | 10 | | 75 | | 85 | 0 | 200 |
| | Esthetics | 10 | 10 | 0 | 5 | 0 | 15 | 10 | 30 | [illegible] | [illegible] | | 15 | 2 | 20 | 2 | 5 | | 15 | 5 | 10 | 7 | 30 | | 5 | | 15 | | 20 | 19 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | 22 | 30 | 87 | 120 | [illegible] | [illegible] | 25 | 30 | 65 | 130 | 10 | 30 | 15 | 30 | 5 | 40 | 30 | 100 | | 10 | | 40 | | 50 | 182 | 400 |
| | Safety | 2 | 5 | 2 | 5 | 5 | 5 | 9 | 15 | [illegible] | 5 | 2 | 5 | 2 | 10 | 5 | 10 | 2 | 5 | 0 | 15 | 7 | 30 | | 5 | | 15 | | 20 | 18 | 75 |
| | Security | 2 | 5 | 0 | 5 | 5 | 5 | 7 | 15 | [illegible] | 5 | 5 | 15 | 5 | 20 | 5 | 15 | 10 | 20 | 0 | 5 | 15 | 40 | | 15 | | 5 | | 20 | 27 | 95 |
| | Esthetics | 15 | 20 | 10 | 15 | 7 | 10 | 32 | 45 | 5 | 10 | 5 | 10 | 10 | 20 | 5 | 5 | 3 | 5 | 0 | 5 | 8 | 15 | | 5 | | 15 | | 20 | 50 | 100 |
| Rubbish | Sanitation | 2 | 5 | 5 | 10 | | 10 | 7 | 25 | 5 | 20 | 10 | 15 | 15 | 35 | 5 | 10 | 10 | 10 | | 15 | 15 | 35 | 5 | 10 | 25 | 35 | 30 | 45 | 67 | 140 |
| | Safety | 7 | 15 | 10 | 20 | | 25 | 17 | 60 | 0 | 20 | 30 | 45 | 30 | 65 | 7 | 15 | 25 | 25 | | 25 | 32 | 65 | 0 | 10 | 15 | 25 | 15 | 35 | 94 | 225 |
| | Security | 2 | 5 | 0 | 5 | | 20 | 2 | 30 | 0 | 5 | 10 | 15 | 10 | 20 | 0 | 5 | 15 | 15 | | 10 | 15 | 30 | 0 | 15 | 20 | 30 | 20 | 45 | 47 | 125 |
| | Esthetics | 10 | 15 | 7 | 15 | | 10 | 17 | 40 | 5 | 10 | 10 | 10 | 15 | 20 | 5 | 5 | 5 | 5 | | 5 | 10 | 15 | 5 | 10 | 10 | 15 | 15 | 25 | 57 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 10 | 20 | 5 | 25 | 15 | 60 | | 15 | | 15 | | 30 | | 20 | | 10 | | 15 | | 45 | | 10 | | 15 | | 25 | 15 | 160 |
| | Safety | | 15 | 10 | 20 | 0 | 5 | 10 | 40 | | 15 | | 5 | | 20 | | 15 | | 5 | | 15 | | 35 | | 10 | | 15 | | 25 | 10 | 120 |
| | Security | | 15 | 0 | 5 | 7 | 15 | 7 | 35 | | 5 | | 15 | | 20 | | 10 | | 15 | | 15 | | 40 | | 10 | | 15 | | 25 | 7 | 120 |
| | Esthetics | | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 4 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 5 | 10 | 5 | 10 | 12 | 25 | 7 | 15 | | 5 | 7 | 20 | 2 | 5 | 5 | 5 | | 5 | 7 | 15 | 2 | 5 | 25 | 35 | 27 | 40 | 53 | 100 |
| | Safety | 10 | 20 | 7 | 15 | 10 | 20 | 27 | 55 | 7 | 15 | | 20 | 7 | 35 | 2 | 10 | 10 | 10 | | 10 | 12 | 30 | 0 | 5 | 15 | 25 | 15 | 30 | 61 | 150 |
| | Security | 5 | 10 | 0 | 5 | 7 | 15 | 12 | 30 | 0 | 5 | | 10 | 0 | 15 | 0 | 5 | 10 | 10 | | 5 | 10 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 32 | 85 |
| | Esthetics | 5 | 10 | 2 | 5 | 2 | 5 | 9 | 20 | 2 | 5 | | 5 | 2 | 10 | 5 | 5 | 5 | 5 | | 5 | 10 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 25 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 2 | 5 | 7 | 15 | 11 | 25 | | 5 | | 15 | | 20 | 3 | 5 | 5 | 5 | | 15 | 8 | 25 | 5 | 10 | 5 | 15 | 10 | 25 | 29 | 95 |
| | Safety | 1 | 5 | 2 | 5 | 2 | 5 | 5 | 15 | | 5 | | 5 | | 10 | 3 | 5 | 3 | 5 | | 5 | 6 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 16 | 55 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 0 | 5 | 3 | 5 | | 5 | 3 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 7 | 50 |
| | Esthetics | 10 | 15 | 2 | 5 | 5 | 10 | 17 | 30 | | 5 | | 10 | | 15 | 5 | 5 | 10 | 10 | | 5 | 15 | 20 | 10 | 15 | 10 | 20 | 20 | 35 | 52 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | 2 | 10 | 6 | 20 | 2 | 5 | 10 | 10 | 12 | 15 | 2 | 5 | | 5 | 0 | 15 | 2 | 25 | | 5 | | 15 | | 20 | 20 | 80 |
| | Safety | 5 | 10 | 5 | 10 | 2 | 10 | 12 | 30 | 2 | 5 | 5 | 10 | 7 | 15 | 2 | 5 | | 5 | 0 | 10 | 2 | 20 | | 5 | | 10 | | 15 | 21 | 80 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | 0 | 5 | 5 | 5 | 5 | 10 | 0 | 5 | | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 7 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 2 | 5 | | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 12 | 50 |
| Total | Sanitation | 83 | 135 | 112 | 185 | 56 | 155 | 251 | 475 | 99 | 210 | 45 | 165 | 144 | 375 | 65 | 135 | 42 | 85 | 5 | 165 | 112 | 385 | 22 | 90 | 135 | 350 | 157 | 440 | 664 | 1675 |
| | Safety | 47 | 115 | 61 | 135 | 24 | 85 | 132 | 335 | 44 | 115 | 37 | 110 | 81 | 225 | 36 | 120 | 45 | 70 | 0 | 95 | 81 | 285 | 0 | 55 | 110 | 180 | 110 | 235 | 404 | 1080 |
| | Security | 24 | 80 | 0 | 40 | 43 | 125 | 67 | 245 | 0 | 40 | 20 | 125 | 20 | 165 | 5 | 55 | 63 | 115 | 0 | 60 | 68 | 230 | 0 | 75 | 92 | 210 | 92 | 285 | 247 | 925 |
| | Esthetics | 57 | 85 | 27 | 60 | 20 | 65 | 104 | 210 | 16 | 50 | 17 | 45 | 35 | 115 | 26 | 40 | 28 | 55 | 5 | 45 | 59 | 140 | 19 | 55 | 42 | 100 | 61 | 155 | 259 | 620 |
| TOTAL | | 211 | 415 | 200 | 420 | 143 | 430 | 554 | 1265 | 161 | 415 | 119 | 465 | 280 | 880 | 132 | 350 | 178 | 325 | 10 | 365 | 320 | 1040 | 41 | 275 | 379 | 840 | 420 | 1115 | 1574 | 4300 |

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TABLE IV-16

# NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

HARBOR GENERAL HOSPITAL - UNIT II

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| | | Def Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def Value | Max. Value | Def. Value | Max Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 30 | 40 | 38 | 50 | 10 | 20 | 78 | 130 | | 50 | 20 | 20 | 20 | 70 | 15 | 50 | | 10 | | 20 | 15 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 203 | 360 |
| | Safety | 20 | 40 | 25 | 50 | 5 | 10 | 50 | 100 | | 45 | 10 | 10 | 10 | 55 | 5 | 45 | | 5 | | 10 | 5 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 140 | 300 |
| | Security | 15 | 30 | 0 | 5 | 15 | 25 | 30 | 60 | | 5 | 25 | 25 | 25 | 30 | 0 | 5 | | 25 | | 10 | 0 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 115 | 300 |
| | Esthetics | 5 | 5 | 2 | 5 | 2 | 5 | 9 | 15 | | 5 | 5 | 5 | 5 | 10 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 5 | 20 | 20 | 20 | 25 | 36 | 65 |
| Surgical, Patho-logical & Animals | Sanitation | 5 | 20 | 10 | 35 | 25 | 35 | 40 | 90 | | 20 | | 35 | | 55 | 0 | 10 | | 10 | 0 | 40 | 0 | 60 | | 20 | | 75 | | 95 | 40 | 300 |
| | Safety | 0 | 5 | 5 | 10 | 2 | 5 | 7 | 20 | | 5 | | 10 | | 15 | 5 | 15 | | 10 | 0 | 5 | 5 | 30 | | 5 | | 5 | | 10 | 12 | 75 |
| | Security | 0 | 5 | 0 | 5 | 20 | 35 | 20 | 45 | | 5 | | 35 | | 40 | 0 | 5 | | 20 | 0 | 5 | 0 | 30 | | 10 | | 75 | | 85 | 20 | 200 |
| | Esthetics | 5 | 10 | 0 | 5 | 10 | 15 | 15 | 30 | | 5 | | 15 | | 20 | 2 | 5 | | 15 | 5 | 10 | 7 | 30 | | 5 | | 15 | | 20 | 22 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | 15 | 30 | 80 | 120 | | 80 | 50 | 50 | 50 | 130 | 15 | 30 | 10 | 30 | 0 | 40 | 25 | 100 | | 10 | | 40 | | 50 | 155 | 400 |
| | Safety | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | 5 | 5 | 5 | 10 | 0 | 10 | 0 | 5 | 0 | 15 | 0 | 30 | | 5 | | 15 | | 20 | 11 | 75 |
| | Security | 2 | 5 | 0 | 5 | 2 | 5 | 4 | 15 | | 5 | 15 | 15 | 15 | 20 | 0 | 15 | 5 | 20 | 0 | 5 | 5 | 40 | | 15 | | 5 | | 20 | 24 | 95 |
| | Esthetics | 15 | 20 | 10 | 15 | 5 | 10 | 30 | 45 | | 10 | 10 | 10 | 10 | 20 | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 5 | | 15 | | 20 | 44 | 100 |
| Rubbish | Sanitation | 2 | 5 | 5 | 10 | 5 | 10 | 12 | 25 | | 20 | 15 | 15 | 15 | 35 | 5 | 10 | | 10 | | 15 | 5 | 35 | 5 | 10 | 25 | 35 | 30 | 45 | 62 | 140 |
| | Safety | 5 | 15 | 5 | 20 | 10 | 25 | 20 | 60 | | 20 | 30 | 45 | 30 | 65 | 5 | 15 | | 25 | | 25 | 5 | 65 | 0 | 10 | 15 | 25 | 15 | 35 | 70 | 225 |
| | Security | 2 | 5 | 0 | 5 | 10 | 20 | 12 | 30 | | 5 | 15 | 15 | 15 | 20 | 0 | 5 | | 15 | | 10 | 0 | 30 | 0 | 15 | 20 | 30 | 20 | 45 | 47 | 125 |
| | Esthetics | 10 | 15 | 7 | 15 | 5 | 10 | 22 | 40 | | 10 | 10 | 10 | 10 | 20 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 10 | 10 | 15 | 10 | 25 | 44 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 5 | 20 | 5 | 25 | 10 | 60 | | 15 | | 15 | | 30 | | 20 | | 10 | | 15 | | 45 | | 10 | | 15 | | 25 | 10 | 160 |
| | Safety | | 15 | 5 | 20 | 0 | 5 | 5 | 40 | | 15 | | 5 | | 20 | | 15 | | 5 | | 15 | | 35 | | 10 | | 15 | | 25 | 5 | 120 |
| | Security | | 15 | 0 | 5 | 5 | 15 | 5 | 35 | | 5 | | 15 | | 20 | | 10 | | 15 | | 15 | | 40 | | 10 | | 15 | | 25 | 5 | 130 |
| | Esthetics | | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 0 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 5 | 10 | 5 | 10 | 12 | 25 | | 15 | 5 | 5 | 5 | 20 | 2 | 5 | | 5 | | 5 | 2 | 15 | 2 | 5 | 25 | 45 | 27 | [illegible] | 46 | [illegible] |
| | Safety | 10 | 20 | 7 | 15 | 10 | 20 | 27 | 55 | | 15 | 15 | 20 | 15 | 35 | 0 | 10 | | 10 | | 10 | 0 | 30 | 0 | 5 | 10 | 25 | 10 | 30 | 52 | 150 |
| | Security | 5 | 10 | 0 | 5 | 7 | 15 | 12 | 30 | | 5 | 10 | 10 | 10 | 15 | 0 | 5 | | 10 | | 5 | 0 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 32 | 85 |
| | Esthetics | 5 | 10 | 0 | 5 | 2 | 5 | 7 | 20 | | 5 | 5 | 5 | 5 | 10 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 16 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 0 | 5 | 3 | 15 | 5 | 25 | | 5 | 15 | 15 | 15 | 20 | 2 | 5 | | 5 | | 15 | 2 | 25 | 5 | 10 | 5 | 15 | 10 | 25 | 32 | 95 |
| | Safety | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | 2 | 5 | 2 | 10 | 0 | 5 | | 5 | | 5 | 0 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 7 | 55 |
| | Security | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | 5 | 5 | 5 | 10 | 0 | 5 | | 5 | | 5 | 0 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 7 | 50 |
| | Esthetics | 5 | 15 | 2 | 5 | 2 | 10 | 9 | 30 | | 5 | 10 | 10 | 10 | 15 | 0 | 5 | | 10 | | 5 | 0 | 20 | 0 | 15 | 10 | 20 | 10 | 35 | 29 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 0 | 5 | 10 | 10 | 12 | 20 | | 5 | | 10 | | 15 | 0 | 5 | | 5 | 0 | 15 | 0 | 25 | | 5 | | 15 | | 25 | 12 | [illegible] |
| | Safety | 5 | 10 | 0 | 10 | 5 | 10 | 10 | 30 | | 5 | | 10 | | 15 | 0 | 5 | | 5 | 0 | 10 | 0 | 20 | | 5 | | 10 | | 15 | 10 | 80 |
| | Security | 0 | 5 | 0 | 5 | 5 | 5 | 5 | 15 | | 5 | | 5 | | 10 | 0 | 5 | | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 5 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | | 5 | | 10 | 2 | 5 | | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 8 | 50 |
| Total | Sanitation | 73 | 135 | 98 | 185 | 78 | 155 | 249 | 475 | | 210 | 105 | 165 | 105 | 375 | 39 | 135 | 10 | 85 | 0 | 165 | 49 | 385 | 22 | 90 | 135 | 345 | 157 | [illegible] | 560 | 1675 |
| | Safety | 42 | 115 | 49 | 135 | 34 | 85 | 125 | 335 | | 115 | 62 | 110 | 62 | 225 | 15 | 120 | 0 | 70 | 0 | 95 | 15 | 285 | 0 | 55 | 105 | 180 | 105 | 285 | 307 | [illegible] |
| | Security | 24 | 80 | 0 | 40 | 64 | 125 | 88 | 245 | | 40 | 70 | 125 | 70 | 165 | 0 | 55 | 5 | 115 | 0 | 60 | 5 | 230 | 0 | 75 | 92 | 210 | 92 | 285 | 255 | 925 |
| | Esthetics | 47 | 85 | 23 | 60 | 28 | 65 | 98 | 210 | | 50 | 40 | 65 | 40 | 115 | 12 | 40 | 2 | 55 | 5 | 45 | 19 | 140 | 0 | 55 | 42 | [illegible] | 42 | 145 | 199 | [illegible] |
| TOTAL | | 186 | 415 | 170 | 420 | 204 | 430 | 560 | 1265 | | 415 | 277 | 465 | 277 | 880 | 66 | 350 | 17 | 325 | 5 | 365 | 88 | 1040 | 22 | 275 | 374 | 840 | 396 | 1115 | 1321 | 4300 |

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CHAP. V RANCHO LOS AMIGOS HOSPITAL

Page No.

DESCRIPTION OF EXISTING PLANT V-1
  Range of Medical Functions and Specialties V-1
  Plant Services and Population V-2
  Location, Buildings and Land V-3

CHARACTERISTICS OF THE SOLID WASTE SYSTEM V-7
  Types of Waste Materials Generated V-7
  Brief Description of the Total System V-8
  Responsibility of Solid Waste Management V-8

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM V-9
  Handling and Storage of Disposable Waste Materials V-9
  Waste Disposal Practices V-10
  Handling and Storage of Reusable Waste Materials V-10
  Quantities and Types of Disposable Waste Materials V-10
  Quantities and Types of Reusable Waste Materials V-11
  Summary of Total Waste Production V-11
  Equipment, Personnel and Disposal Fees V-13

OBSERVATIONS OF THE IN-BUILDING SYSTEM V-14
  Handling of Disposable Waste Materials V-14
  Handling of Reusable Waste Materials V-14
  Equipment and Personnel Requirements V-15

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM V-17

EVALUATION OF EXISTING SYSTEM OPERATION V-21
  The Developed Rating V-21

Page No.

## LIST OF TABLES

V-1 Shift Population and Waste Production V-3
V-2 Summary of Daily Waste Production V-12
V-3 Daily Requirements for In-Building Waste Handling V-15
V-4 Labor Requirements of In-Building Waste System V-16
V-5 Estimated Daily Labor Costs of Hospital Solid Waste Systems V-18
V-6 Distribution of Estimated Annual Costs to Waste System System Components V-19
V-7 Cost Comparison of Disposable and Reusable Wastes V-20
V-8 Description of Hospital Solid Waste Systems V-22
V-9 Numerical Rating of Hospital Solid Waste Systems V-23

## LIST OF FIGURES

V-1 Site Plan V-5
V-2 Aerial Photograph of Rancho Los Amigos Hospital V-6

## DESCRIPTION OF EXISTING PLANT

Established in 1888, Rancho Los Amigos Hospital has evolved from a history of changing functions. The initial role of this facility in the community was that of the County Poor Farm. In the 1920's, its function was oriented to that of a nursing home providing a custodial care program. In the 1940's, its function was again reoriented by need and became the principal area rehabilitative center for polio victims. From this role, its more recent evolution has produced a modern rehabilitation center for County residents with chronic or long-term disabilities resulting from catastrophic diseases or injury. Rancho's services are available not only to the acute units of the County's hospital system and other community hospitals within the County, but admissions of qualifying out-of-county patients are also permitted by special arrangements. Through its affiliation with the University of Southern California School of Medicine, upgrading of this medical facility is continuing.

### Range of Medical Functions and Specialties:

Rancho is operated to provide specialized inpatient, outpatient and home care services. This does not include routine medical and emergency care. It offers specialized preventive, diagnostic, therapeutic and rehabilitative care.

Crossing conventional specialty lines of medical services, Rancho's comprehensive rehabilitative care includes the following primary categorical programs:

(1) Amputation, along with prosthetic engineering;

(2) Problem fractures;

(3) Cardiac rehabilitation;

(4) Cerebral palsy and children's reconstruction;

(5) Hip and spine deformities;

(6) Neurological sciences (including stroke);

(7) Pulmonary (including poliomyelitis and emphysema);

(8) Rheumatology (and arthritis);

(9) Spinal cord injuries.

Plant Services and Population Related to Solid Waste Production:

Present plant services maintained at this facility and staffed by hospital personnel include the Dietary Department, which prepares some 4,000 meals daily, the Laundry, which processes about 19,000 pounds of soiled linen daily, Housekeeping, Transportation and Maintenance. Volunteer and recreation activities are emphasized in their importance at this facility, as well as schooling for pre-school age through high school which is provided for the handicapped.

The Business, Personnel, Medical Records and Purchasing Departments provide those administrative services required in further support of the plant activities. A nursing staff of 403 and 1,297 aides (attendants) are involved in the various aspects of patient care functions.

Total population in the Rancho complex, including patients and paid and non-compensated personnel, represent 5,471 persons scheduled over a seven-day week, 24-hour day basis. From daily census records and ordinance personnel lists, this population consists of about 929 bed patients (avg. seven-day basis), 36 outpatients (avg. five-day basis), 3,272 paid employees and 1,233 non-compensated workers.

Table V-1 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE V-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 929 | 929 | 929 | 929 | 929 | 929 |
| Outpatients | 36 | --- | --- | --- | --- | --- |
| Paid Personnel | 1,220 | 550 | 550 | 1,100 | 550 | 550 |
| Non-Comp. Personnel | 617 | 410 | 206 | --- | --- | --- |
| Total Est. Population/Shift | 2,802 | 1,889 | 1,685 | 2,029 | 1,479 | 1,479 |
| Avg. Shift & Daily Pop. | *2,120 | | | 1,662 | | |
| Rate of Waste Production: | | | | | | |
| % of Daily Production | 44% | 29% | 27% | 42% | 29% | 29% |

*Includes Outpatients Weighted 1/2 Value

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

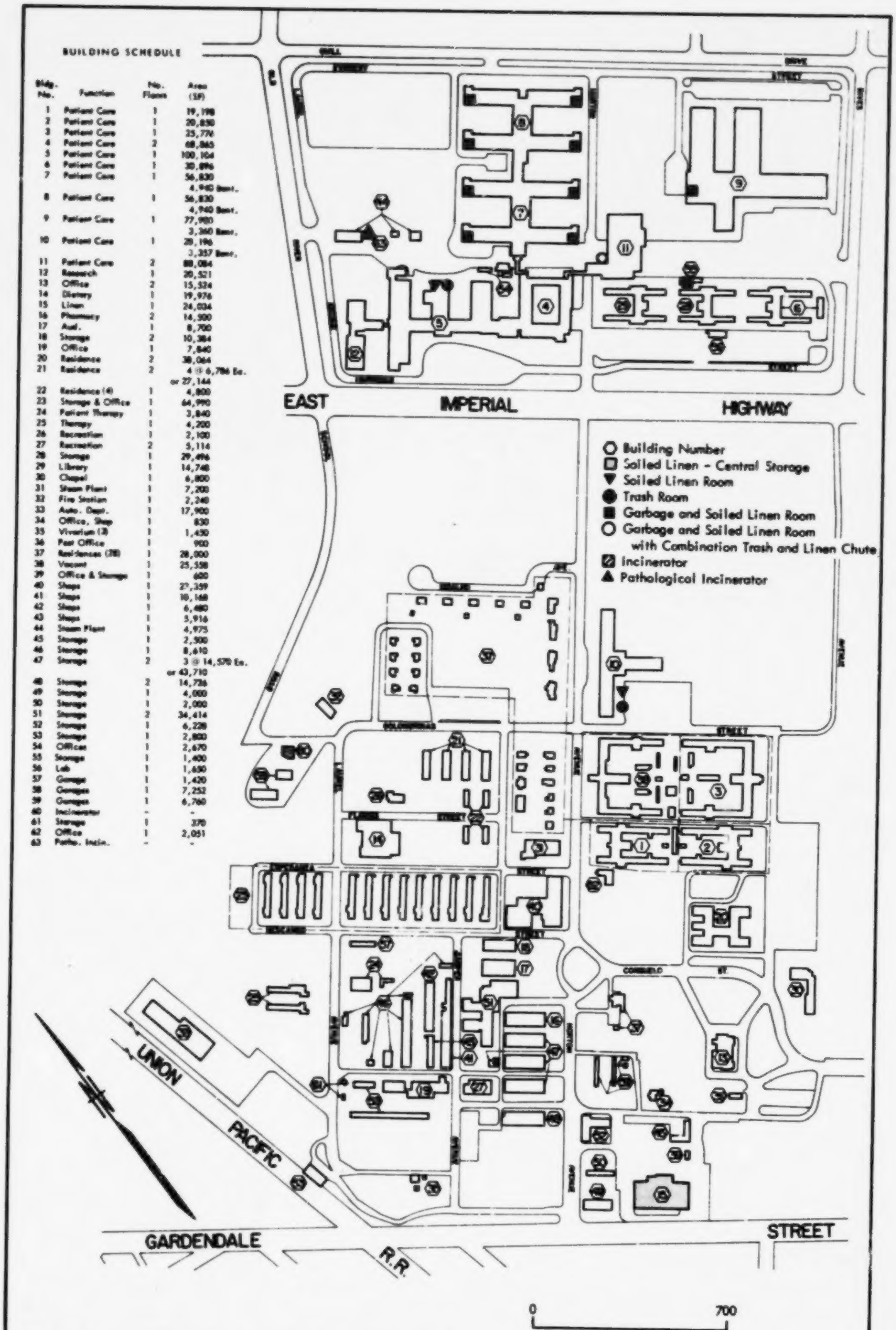
Location, Buildings and Land:

Rancho Los Amigos Hospital is located in Downey, California, about 12 miles southeast of the downtown Los Angeles Civic Center. It is situated on an irregular shaped site 3,900 feet in length, averaging about 2,200 feet in width, and comprised of about 200 acres in land area. The entire property is relatively flat and is divided into two separate parcels by a major thoroughfare, Imperial Highway. The smaller parcel of some 50 acres, on the northeast side of this thoroughfare, contains relatively permanent and predominantly new structures. The larger parcel to the southwest containing some 150 acres is sparsely developed and contains a complex of obsolete one and two-story structures, as well as several permanent buildings.

Figure V-1, the general site plan, identifies these parcels and identifies the existing buildings. The building schedule provides further detail on functions, building area, number of stories, etc. on each of the buildings. Most older long-term wards are scheduled for replacement.

Collectively, this complex of buildings represents a gross building area of about 1,191,000 square feet of which 454,000 square feet is permanent structure. This total complex, together with land, equipment and vehicles, is valued at approximately $50,000,000. Future ward replacement and expansion programs for this facility as indicated by preliminary master plans will be confined to the larger southwesterly parcel.

Figure V-2, an aerial photograph, further illustrates the character of the area and relationship of buildings within the complex.

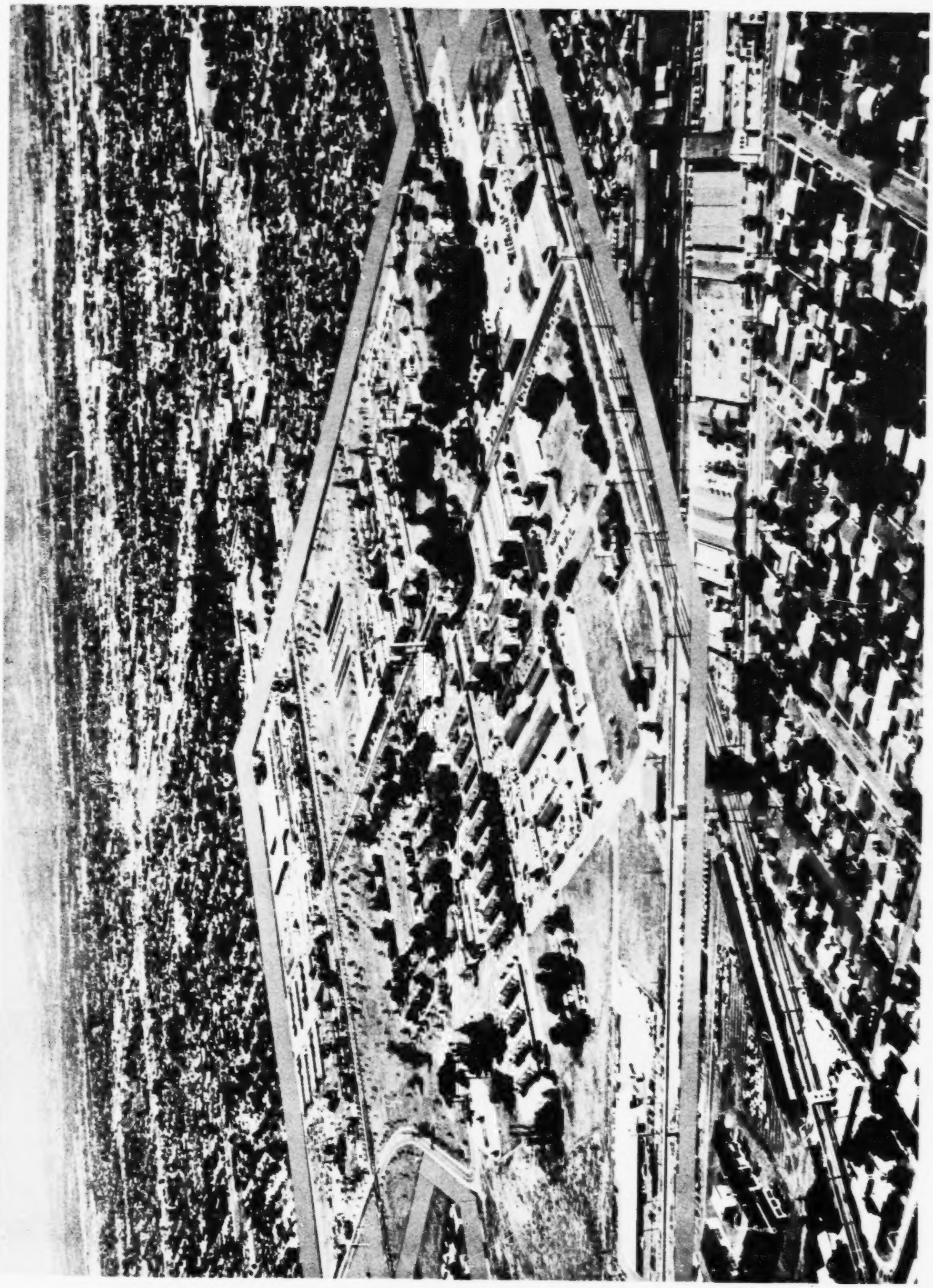

EAST
IMPERIAL
HIGHWAY
○ Building Number
☐ Soiled Linen - Central Storage
▼ Soiled Linen Room
● Trash Room
■ Garbage and Soiled Linen Room
○ Garbage and Soiled Linen Room with Combination Trash and Linen Chute
▨ Incinerator
▲ Pathological Incinerator
UNION
PACIFIC
R.R.
GARDENDALE
STREET
CONSUELO
ST.
0
700
SCALE OF FEET

BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Patient Care | 1 | 19,198 |
| 2 | Patient Care | 1 | 20,830 |
| 3 | Patient Care | 1 | 25,776 |
| 4 | Patient Care | 2 | 68,865 |
| 5 | Patient Care | 1 | 100,104 |
| 6 | Patient Care | 1 | 30,896 |
| 7 | Patient Care | 1 | 56,830<br>4,940 Bsmt. |
| 8 | Patient Care | 1 | 56,830<br>4,940 Bsmt. |
| 9 | Patient Care | 1 | 77,900<br>3,360 Bsmt. |
| 10 | Patient Care | 1 | 28,196<br>3,357 Bsmt. |
| 11 | Patient Care | 2 | 88,084 |
| 12 | Research | 1 | 20,521 |
| 13 | Office | 2 | 15,524 |
| 14 | Dietary | 1 | 19,976 |
| 15 | Linen | 1 | 24,034 |
| 16 | Pharmacy | 2 | 14,500 |
| 17 | Aud. | 1 | 8,700 |
| 18 | Storage | 2 | 10,384 |
| 19 | Office | 1 | 7,840 |
| 20 | Residence | 2 | 38,064 |
| 21 | Residence | 2 | 4 @ 6,786 Ea.<br>or 27,144 |
| 22 | Residence (4) | 1 | 4,800 |
| 23 | Storage & Office | 1 | 64,990 |
| 24 | Patient Therapy | 1 | 3,840 |
| 25 | Therapy | 1 | 4,200 |
| 26 | Recreation | 1 | 2,100 |
| 27 | Recreation | 2 | 5,114 |
| 28 | Storage | 1 | 29,496 |
| 29 | Library | 1 | 14,740 |
| 30 | Chapel | 1 | 6,800 |
| 31 | Steam Plant | 1 | 7,200 |
| 32 | Fire Station | 1 | 2,240 |
| 33 | Auto. Dept. | 1 | 17,900 |
| 34 | Office, Shop | 1 | 830 |
| 35 | Vivarium (2) | 1 | 1,450 |
| 36 | Post Office | 1 | 900 |
| 37 | Residences (28) | 1 | 28,000 |
| 38 | Vacant | 1 | 25,558 |
| 39 | Office & Storage | 1 | 600 |
| 40 | Shops | 1 | 27,359 |
| 41 | Shops | 1 | 10,168 |
| 42 | Shops | 1 | 6,480 |
| 43 | Shops | 1 | 5,916 |
| 44 | Steam Plant | 1 | 4,975 |
| 45 | Storage | 1 | 2,500 |
| 46 | Storage | 1 | 8,610 |
| 47 | Storage | 2 | 3 @ 14,570 Ea.<br>or 43,710 |
| 48 | Storage | 2 | 14,726 |
| 49 | Storage | 1 | 4,000 |
| 50 | Storage | 1 | 2,000 |
| 51 | Storage | 2 | 34,414 |
| 52 | Storage | 1 | 6,228 |
| 53 | Storage | 1 | 2,800 |
| 54 | Offices | 1 | 2,670 |
| 55 | Storage | 1 | 1,400 |
| 56 | Lab | 1 | 1,650 |
| 57 | Garage | 1 | 1,420 |
| 58 | Garages | 1 | 7,252 |
| 59 | Garages | 1 | 6,760 |
| 60 | Incinerator | - | - |
| 61 | Storage | 1 | 370 |
| 62 | Office | 1 | 2,051 |
| 63 | Patho. Incin. | - | - |

Site Plan of Rancho Los Amigos Hospital

FIGURE V-1



Aerial Photograph of Rancho Los Amigos Hospital

FIGURE V-2

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

The physical layout of this facility, the nature of its present use and the ability to function with a relatively low number of workers per bed patient provides conditions for a relatively simple solid waste system.

### Types of Waste Materials Generated:

Although the types of patients and range of medical care specialties differ considerably from those of the LAC-USC Medical Center, categories of wastes to be found are generally parallel. These categories resolved for detailed studies are limited to the following:

| | |
|---|---|
| 1. Sharps, needles, blades, etc. | (Disposable) |
| 2. Pathological | (Disposable) |
| 3. Soiled linen | (Reusable) |
| 4. Rubbish or mixed refuse | (Disposable) |
| 5. Patient care items | (Reusable) |
| 6. Non-combustible - glass, metals and ashes | (Disposable) |
| 7. Garbage (Non-Grindable) | (Disposable) |
| 8. Food service items | (Reusable) |

These categories basically include garbage, mixed refuse, segregated non-combustibles, special wastes and reusables. At this plant, pathological wastes are to be found in minimal quantities. Reusables, such as soiled linens, will be found in quantities that exceed the combined amounts of conventional disposable wastes.

Brief Description of the Total System:

Methods of on-site disposal of solid wastes at Rancho Los Amigos are limited to grinding of food preparation wastes, incineration of pathologic wastes, with transport of the balance of disposable wastes to a transfer station for ultimate transfer to a landfill.

Hand cart collection of materials prevails in the floor activities of these buildings with initial storage of plastic bagged materials in utility rooms. Custodians transfer this accumulated material outside to "curbside" locations to await packer truck pickup.

Soiled linens are collected in a similar manner. Bagged materials are stored in utility rooms and later transferred to "curbside" locations for pickup by the hospital laundry truck. Handling of food service equipment is generally confined to the ward service kitchen, with food carts being transferred between the main kitchen and ward buildings via truck. Similarly, reusable patient items are cleaned for reuse in ward utility rooms or transferred by truck to Central Supply for autoclaving when required.

Responsibility of Solid Waste Management:

General Services is charged with the responsibility of solid waste management. The Transportation Division provides separate on-site collections of soiled linen, rubbish, infectious wastes, reusable patient items and food carts, as well as off-site transport for mixed refuse and incinerator residue. Custodians, laundry workers, food service workers, laboratory technicians and Central Supply workers are involved in various aspects of waste handling within the buildings in addition to the activities of nurses and aides.

## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Field observations were conducted during the latter months of 1968 at Rancho Los Amigos to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

### Handling and Storage of Disposable Waste Materials:

Initial inspections at Rancho Los Amigos were made to identify the characteristics and functions of the inter-building solid waste system. Figure V-1 illustrates the building layout of this plant. Each of the buildings in this one-story complex represent a potential of one or more accumulation points for both disposable and reusable wastes, with the network of streets and service drives representing the route of the "curbside" collection of these materials.

A building-to-building type collection service prevailed at the time of the initial observations. In most cases, custodial personnel collect accumulated bagged wastes (both mixed refuse and segregated non-combustibles) from utility rooms and transport the material to "curbside" locations for later truck pickup. Separate storage rooms for wastes are provided at limited locations in the newer buildings. Collections by the rear-loading packer truck are twice daily or as may be required. Litter occurring in the loading area is promptly cleared.

A separate collection of infectious wastes and pathologic wastes is made. Containerized material is collected directly from utility rooms and transported to the on-site pathologic incinerator. Disposable syringes, blades, etc. are also handled in a separate collection, being returned to Central Supply where they are autoclaved. These sterilized materials are later collected by the packer truck in its general collection. Relatively small quantities of animal carcasses are held in refrigerated storage for later collection by County Animal Shelter personnel.

Waste Disposal Practices:

Throughout the period of observation, all disposable waste materials, with the exception of pathological wastes, food preparation wastes and animal carcasses, were hauled by the hospital packer truck to the County-operated South Gate Transfer Station. Pathological wastes were incinerated in the on-site pathological incinerator. Food preparation wastes were deposited directly in kitchen grinders for discharge to sewers. Animal carcasses were collected by personnel from the County Animal Shelter.

Handling and Storage of Reusable Waste Materials:

A building-to-building collection service is also provided for soiled linen. In most cases, bagged materials are transferred from utility rooms to open "curbside" locations by laundry workers. A van type truck is used in the collection and transport of this material to the on-site laundry. Separate truck collections of food carts are made from each of the buildings for transfer to the main kitchen for reprocessing by food service workers. Reusable patient care items are also collected separately for transfer to Central Supply for reprocessing.

Quantities and Types of Disposable Waste Materials:

During November, 1968, a quantity survey of solid wastes was made to determine the types and volumes of disposable materials produced daily in the plant. Portable scales were used on the truck collection routes. Scale records were developed on disposable wastes over a seven-day period. During this period, typical activity included the daily servicing of some 40 to 50 locations for the collection of mixed refuse. On the average, about 200 containers (bags or cans) were handled daily. Separate collections of infectious wastes, sharps and other disposables resulted in relatively insignificant quantities of the individual waste materials.

Collectively, all disposable wastes generated at Rancho Los Amigos were calculated at 5,544 pounds daily, or equivalent to about 6.0 pounds per bed patient, or 1.0 pound per capita (based on occupancy of 929 and gross population of 5,471).

Quantities and Types of Reusable Waste Materials:

The principal identifiable materials to be found in the system and classified in this study as reusable solid wastes consist of soiled linen and food service items. Total materials processed by the on-site laundry average about 490,000 pounds per month, which is equivalent to about 16,320 pounds daily or 17.6 pounds per bed patient per day. Reusable food service items were estimated at about 4,200 pounds daily, based on 1.5 pounds per patient meal. Reusable patient care items were found only in trace amounts in the inter-building system.

Summary of Total Waste Production:

In summary, Table V-2 presents the types and quantities of wastes that may be expected to be generated daily at Rancho Los Amigos. The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

### TABLE V-2 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors | |
|---|---|---|---|---|
| | | | Lbs./Bed Patient | Lbs./Capita |
| Sharps, Needles, Etc. | 40 | .2 | TR | TR |
| Path. & Surgical | 4 | TR | TR | TR |
| Soiled Linen | 16,320 | 62.6 | 17.6 | 3.0 |
| Rubbish | 2,760 | 10.6 | 3.0 | .5 |
| Reusable Patient Items | TR | TR | TR | TR |
| Non-Combustibles | 725 | 2.8 | .8 | .1 |
| Garbage (Non-Grindable) | 875 | 3.3 | .9 | .2 |
| Food Service Items | 4,200 | 16.1 | 4.5 | .8 |
| Ash & Residue | 20 | .1 | TR | TR |
| Animal Carcasses | 20 | .1 | TR | TR |
| Food Waste (Grindable) | 1,100 | 4.2 | 1.2 | .2 |
| TOTAL WASTES | 26,064 | 100.0 | 28.1 | 4.8 |
| Total Disposable | 5,544 | 21.3 | 6.0 | 1.0 |
| Total Reusable | 20,520 | 78.7 | 22.1 | 3.8 |

*Based Avg. Census of 929 Bed Patients Daily and Gross Population of 5,471

Note - Total Production Related to Gross Bldg. Area of 1,191,000 SF:
Disposables @ 4.7 Lbs./MSF, Reusables @ 17.2 Lbs./MSF
or Total of 21.9 Lbs./MSF Daily.

Equipment, Personnel and Disposal Fees:

Limited hospital equipment and personnel are involved in the inter-building and off-site system. The equivalent of two full time employees handle the required daily movements of all disposable wastes. The equivalent of two employees is also required to handle reusable materials. Material handling equipment is limited to hand carts and trucks for inter-building collection and off-site transport requirements. Special equipment for on-site waste disposal is limited to the pathologic incinerator and kitchen grinders. Disposal fees at the transfer station averaged about $5.00 per day during the observation period.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at Rancho Los Amigos were made of the functions of the in-building operation (Unit and Inter-Unit System). These observations were directed to the mechanics of handling, handling techniques, equipment used and manpower employed in handling of solid wastes, all in an effort to establish operating standards, efficiencies and a basis of determining costs of the present waste system.

### Handling of Disposable Waste Materials:

Custodians are the principal handlers of disposable waste materials. Wastebaskets and other containers are disinfected daily and lined with plastic bags for reuse. Containers are emptied by removing filled plastic bags and then are deposited in the plastic liner within a suspended cloth bag on the custodial cart. These plastic liners are tied when filled and placed in utility rooms for later collection. Segregated non-combustibles are also collected by custodians and are stored in utility rooms to await collection.

Limited quantities of pathologic wastes are immediately placed in closed containers upon the creation of the waste material. These containers are temporarily stored in utility rooms to await transport to the pathologic incinerator.

Disposable syringes are placed in metal containers and stored in utility rooms until collected for return to Central Supply. These materials are autoclaved by Central Supply prior to depositing with mixed refuse for disposal.

Garbage resulting from meal service is collected by food service workers, bagged and stored in service kitchens. It is later transferred to "curbside" locations with other mixed refuse for collection by the packer truck.

### Handling of Reusable Waste Materials:

Nurses' aides (attendants) generally handle the soiled linen, reusable patient care and food service items at the ward level with the assistance of laundry workers, custodians and food service workers as may be required.

Equipment and Personnel Requirements:

Other than custodial and food service carts, relatively no equipment is utilized or required in this simple system. Transport distances to storage points for the most part are reasonable. Personnel requirements appear to be minimal. Observations were made to relate daily manpower requirements to the operation of the in-building system. An equivalent of some 56 mandays was estimated to be required for daily operation. Table V-3, illustrating labor requirements for each type of waste material, was prepared for comparison to other hospitals under study. The composite time factors (minutes per bed) developed from field observations indicate 29.2 minutes per bed patient day is devoted to handling of solid wastes in the in-building system.

TABLE V-3 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| | Manhours by Personnel Classifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type of Waste | Nurses | Aides | Cust. | Lndry. Wrkr. | (1) Other | Total | Equiv. Man Days | Min. Per Bed |
| Sharps | 14.0 | -- | -- | -- | -- | 14.0 | 1.8 | .9 |
| Soiled Linen | -- | 154.0 | -- | 3.9 | -- | 157.9 | 19.7 | 10.2 |
| Patient Care Items | -- | 3.0 | -- | -- | -- | 3.0 | .4 | .2 |
| Food Service Items | -- | 23.0 | -- | -- | 24.7 | 47.7 | 5.9 | 3.1 |
| Rubbish | -- | 69.0 | 127.1 | -- | -- | 196.1 | 24.6 | 12.7 |
| Non-Comb. | -- | -- | 10.0 | -- | -- | 10.0 | 1.2 | .7 |
| Other (2) | 0.5 | -- | -- | -- | 21.0 | 21.5 | 2.7 | 1.4 |
| TOTAL | 14.5 | 249.0 | 137.1 | 3.9 | 45.7 | 450.2 | -- | 29.2 |
| Equivalent Man Days | 1.8 | 31.1 | 17.2 | .5 | 5.7 | -- | 56.3 | -- |

(1) Food Service Workers, Lab. Tech.

(2) Pathological, Garbage (Non-Grindable) and Food Waste (Grindable)

Table V-4 was prepared to illustrate the manpower load requirements on major personnel classifications involved in the in-building solid waste system. It shows average daily personnel available (7 day basis) and the number and percent required for handling of solid wastes. Further detail on personnel requirements, including labor cost estimates in handling of solid wastes within each of the various components of the system, will be presented at the close of this chapter.

TABLE V-4 LABOR REQUIREMENTS OF IN-BUILDING WASTE SYSTEM

| Personnel Classification | Man Day Distribution | | |
|---|---|---|---|
| | (1) Total Available | Required for Waste Handling | |
| | | Man Days | % of Total |
| Nurses | 288 | 1.8 | .4 |
| Nurses Aides | 922 | 31.1 | 3.7 |
| Custodians | 118 | 17.2 | 14.6 |

(1) 7-Day Basis of Ordinance Positions

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

The foregoing text described the functions of the relatively simple solid waste system at Rancho Los Amigos and noted the limited equipment and personnel involved in systems operation. The principal costs of operation as found in all hospital systems under study is that of labor. Labor costs for the total system, including payroll taxes, insurance and social benefits, have been calculated at about $628,165 annually, or $1,721 per calendar day. Table V-5 relates types of employees involved in waste handling and the distribution of estimated daily labor costs to the various types of wastes, as well as the components of the total waste system.

Other readily identifiable cost elements of the system include such items as the pathologic incinerator, vehicular equipment and disposal fees. Miscellaneous expendables, such as replaceable containers, reusable and disposable bags, etc. used throughout the system, collectively represent cost factors that should be considered. A summary of the estimated annual and daily expense of the system, based on the foregoing data, is shown in Table V-6, which also relates these costs to the various components of the waste system.

TABLE V-5

## ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

RANCHO LOS AMIGOS HOSPITAL

| Types of Waste | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | |
| Sharps, Needles, Etc. | Nurse | $ 5.72 | 14.0 | $ 30.08 | $ 80.08 | | | | | | Truck Dr.<br>Lab.Tech. | $4.74<br>4.12 | 0.2<br>0.25 | $ 0.95<br>1.03 | $ 1.98 | Truck Dr. | $4.74 | 0.1 | $0.47 | $ 0.47 | $ 82.53 |
| Pathological and Surgical | Nurse | 5.72 | 0.5 | 2.86 | 2.86 | | | | | | Truck Dr. | 4.74 | 0.5 | 2.37 | 2.37 | | | | | | 5.23 |
| Soiled Linen | Attendant | 3.34 | 154.0 | 514.36 | 514.36 | Laund.Wk | $3.25 | 3.9 | $12.68 | $12.68 | Truck Dr.<br>Laund.Wk | 4.74<br>3.25 | 2.0<br>2.0 | 9.48<br>6.50 | 15.98 | | | | | | 543.02 |
| Rubbish | Attendant<br>Custodian | 3.34<br>3.71 | 69.0<br>124.0 | 230.46<br>460.04 | 690.50 | Custodian | 3.71 | 3.1 | 11.50 | 11.50 | Truck Dr. | 4.74 | 7.5 | 35.55 | 35.55 | Truck Dr. | 4.74 | 1.0 | 4.74 | 4.74 | 742.29 |
| Reusable Patient Items | Attendant | 3.34 | 3.0 | 10.02 | 10.02 | | | | | | Truck Dr.<br>LabTech. | 4.74<br>4.12 | 1.5<br>3.0 | 7.11<br>12.36 | 19.47 | | | | | | 29.49 |
| Non-Combustible | Custodian | 3.71 | 10.0 | 37.10 | 37.10 | | | | | | Truck Dr. | 4.74 | 0.3 | 1.42 | 1.42 | Truck Dr. | 4.74 | 0.3 | 1.42 | 1.42 | 39.94 |
| Garbage (Non-Grindable) | Fd.Srv.Wk. | 3.42 | 8.0 | 27.36 | 27.36 | Fd.Srv.Wk | 3.42 | 1.5 | 5.13 | 5.13 | Truck Dr. | 4.74 | 0.4 | 1.90 | 1.90 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | 34.86 |
| Food Service Items | Fd.Srv.Wk<br>Attendant | 3.42<br>3.34 | 20.8<br>23.0 | 71.14<br>76.82 | 147.96 | Fd.Srv.Wk | 3.42 | 3.9 | 13.34 | 13.34 | Truck Dr.<br>Fd.Srv.Wk | 4.74<br>3.42 | 4.5<br>4.5 | 21.33<br>15.39 | 36.72 | | | | | | 198.02 |
| Radiological | Radiation Phys. | 10.76 | 0.25 | 2.69 | 2.69 | | | | | | | | | | | | | | | | 2.69 |
| Ash & Residue | Truck Dr. | 4.74 | 0.5 | 2.37 | 2.37 | | | | | | | | | | | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | 2.84 |
| Animal Carcasses | Anim. Caretkr. | 3.51 | 0.75 | 2.63 | 2.63 | | | | | | Truck Dr. | 4.74 | 0.75 | 3.56 | 3.56 | | | | | | 6.19 |
| Food Waste (Grindable) | Fd.Srv.Wk | 3.42 | 10.0 | 34.20 | 34.20 | | | | | | | | | | | | | | | | 34.20 |
| | | | | | $1552.13 | | | | | $42.65 | | | | | $118.95 | | | | | $ 7.57 | $1721.30 |

TABLE V-6 DISTRIBUTION OF ESTIMATED ANNUAL COSTS TO WASTE SYSTEM COMPONENTS

| Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | | Average Daily Cost |
|---|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Inter-Building | Off-Site | Total | | |
| | | | | | Cost | % | |
| Bldg. & Fixed Equip. | $ 570 | $ -0- | $ -0- | $ -0- | $ 570 | .2 | $ 1.50 |
| Maint. & Repairs | 190 | -0- | -0- | -0- | 190 | -0- | .50 |
| Vehicular Equip. Carts | -0- | -0- | 2,250 | 250 | 2,500 | .4 | 7.00 |
| Oper. & Maint. | -0- | -0- | 7,650 | 850 | 8,500 | 1.3 | 23.00 |
| Disposal Fees (Transfer Station) | -0- | -0- | -0- | 1,825 | 1,825 | .3 | 5.00 |
| Misc. Expend. Supplies | 8,000 | 600 | 6,000 | -0- | 1[illegible],600 | 2.2 | 40.00 |
| SUB-TOTAL | $ 8,760 | $ 600 | $ 15,900 | $2,925 | $ 28,185 | 4.4 | $ 77.00 |
| Labor (Taxes, Ins., Benefits) | 566,480 | 15,695 | 43,435 | 2,555 | 628,165 | 95.6 | 1721.00 |
| TOTAL | $575,240 | $16,295 | $59,335 | $5,480 | $656,340 | -- | $ -- |
| Avg. Cost Per Day | $ 1,575 | $ 45 | $ 163 | $ 15 | $ -- | -- | $1798.00 |
| % of Total | 87.6% | 2.5% | 9.1% | .8% | $ -- | 100.0% | -- |

Collectively all costs, exclusive of labor, are slightly more than 4% of the total annual costs of the waste system. It is of interest to note that total annual costs of the waste system are equivalent to 3.3% of the total annual operating budget of Rancho Los Amigos, which in 1969 was $19,819,000.

Table V-7 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the costs of reprocessing the reusable materials.

TABLE V-7 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| | | Daily Costs of Handling & Disposal | | | | | |
|---|---|---|---|---|---|---|---|
| Type of Waste | Avg. Wt. Lbs./Day | Labor | Bldg. & Equip. | *Other | Total | Avg. Cost Per Ton | Pe Bea |
| Disposables: | | | | | | | |
| Rubbish | 2,760 | $ 742 | $15 | $45 | $ 801 | $580 | $ .86 |
| Other | 2,784 | 208 | 0 | 0 | 208 | 149 | .22 |
| Total | 5,544 | $ 950 | $15 | $45 | $1,010 | $364 | $1.08 |
| Reusables: | | | | | | | |
| Soiled Linen | 16,320 | $ 543 | $17 | $ 0 | $ 560 | $ 69 | $ .60 |
| Food Service Items | 4,200 | 198 | 0 | 0 | 198 | 94 | .21 |
| Other | TR | 30 | 0 | 0 | 30 | - | .03 |
| Total | 20,500 | $ 771 | $17 | $ 0 | $ 788 | $ 77 | $ .84 |
| Total All Materials | 26,044 | $1,721 | $32 | $45 | $1,798 | $138 | $1.92 |

*Miscellaneous expendable supplies and disposal fees

## EVALUATION OF EXISTING SYSTEM OPERATION

A summary description of the separate solid waste systems employed at Rancho Los Amigos is shown in Table V-8. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site Systems) for each type of waste.

Examination of this summary indicates that nearly all on-site movement of waste materials is limited to manual methods. In comparison to multistory units, rehandling of materials is somewhat simplified by elimination of vertical transportation requirements. Even so, each material is generally subject to multiple rehandlings between points of generation and ultimate deposit. In evaluation of the existing system, the effectiveness of the preparation of wastes related to sanitation, safety and security during handling and storage was of prime importance. In effect, this evaluation as related to on-site handling is largely an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

### The Developed Rating:

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Table V-9 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this Table will indicate that areas where major deficiencies occur are largely limited to on-site storage facilities and off-site landfill disposal.

TABLE V-8

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

RANCHO LOS AMIGOS HOSPITAL

| | | | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Av. Daily Weight | % of Total | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 40 | .2 | Metal Container | Manual | Utility Room | --- | --- | Hospital Vehicle | Central Supply | Autoclave | Hospital Packer Truck | *Landfill |
| Pathological and Surgical | 4 | TR | Lined Closed Container | Manual | Curbside | --- | --- | Open Truck | Fenced Area | Incinerator | --- | --- |
| Soiled Linen | 16,320 | 62.6 | Cloth Bag | Manual | Utility Room | --- | Curbside | Open Truck | Single Purpose Storage Area | Laundry | --- | --- |
| Rubbish | 2,760 | 10.6 | Lined Container | Hand Cart | Utility Room | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | *Landfill |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room | --- | --- | Hospital Vehicle | Central Supply | Autoclave | --- | --- |
| Non-Combustible | 725 | 2.8 | Lined Container | Manual | Utility Room | --- | --- | Hospital Packer Truck | --- | --- | Hospital Packer Truck | *Landfill |
| Garbage (Non-Grindable) | 875 | 3.3 | Lined Container | Manual | Service Kitchen | --- | Curbside | Hospital Packer Truck | --- | --- | Hospital Packer Truck | *Landfill |
| Food Service Items | 4,200 | 16.1 | Plastic Tray | Special Cart | Service Kitchen | --- | Curbside | Open Truck | --- | Kitchen | --- | --- |
| Radiological | TR | TR | Sealed Metal Container | Manual | Special Storage Area | --- | Wash Basin Drain | Sewer Line | --- | --- | Sewer Line | Sewer Treatment Plant |
| Ash & Residue | 20 | .1 | Metal Container | Manual | Storage Area | --- | --- | Hospital Packer Truck | --- | --- | Hospital Packer Truck | *Landfill |
| Animal Carcasses | 20 | .1 | Plastic Bag | Manual | Freezer | --- | --- | Hospital Vehicle | Vivarium | --- | County Pound Truck | County Animal Shelter |
| Food Waste (Grindable) | 1,100 | 4.2 | Open Container | Manual | Grinder | --- | --- | Sewer | --- | --- | Sewer | Sewer Treatment Plant |

*All via transfer station

TABLE V-9

NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

RANCHO LOS AMIGOS HOSPITAL

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 0 | 40 | 0 | 50 | 0 | 20 | 0 | 110 | | 50 | | 20 | | 70 | 10 | 50 | 0 | 10 | 0 | 20 | 10 | 80 | 5 | 20 | 20 | 80 | 25 | 100 | 35 | 360 |
| | Safety | 0 | 40 | 0 | 50 | 0 | 10 | 0 | 100 | | 45 | | 10 | | 55 | 12 | 45 | 0 | 5 | 0 | 10 | 12 | 60 | 0 | 10 | 45 | 75 | 45 | 85 | 57 | 300 |
| | Security | 0 | 30 | 0 | 5 | 7 | 25 | 7 | 60 | | 5 | | 25 | | 30 | 0 | 5 | 0 | 25 | 0 | 10 | 0 | 40 | 0 | 10 | 30 | 60 | 30 | 70 | 37 | 200 |
| | Esthetics | 0 | 5 | 0 | 5 | 1 | 5 | 1 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 0 | 5 | 0 | 5 | 2 | 15 | 0 | 5 | 20 | 20 | 20 | 25 | 23 | 65 |
| Surgical, Pathological & Animals | Sanitation | 0 | 20 | 0 | 35 | 20 | 35 | 20 | 90 | | 20 | | 35 | | 55 | 0 | 10 | 5 | 10 | 0 | 40 | 5 | 60 | | 20 | | 75 | | 95 | 25 | 300 |
| | Safety | 0 | 5 | 0 | 10 | 5 | 5 | 5 | 20 | | 5 | | 10 | | 15 | 5 | 15 | 2 | 10 | 0 | 5 | 7 | 30 | | 5 | | 5 | | 10 | 12 | 75 |
| | Security | 0 | 5 | 0 | 5 | 35 | 35 | 35 | 45 | | 5 | | 35 | | 40 | 0 | 5 | 10 | 20 | 0 | 5 | 10 | 30 | | 10 | | 75 | | 85 | 45 | 200 |
| | Esthetics | 0 | 10 | 0 | 5 | 15 | 15 | 15 | 30 | | 5 | | 15 | | 20 | 2 | 5 | 5 | 15 | 0 | 10 | 7 | 30 | | 5 | | 15 | | 20 | 22 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 5 | 50 | 15 | 30 | 50 | 120 | | 80 | 40 | 50 | 40 | 130 | 5 | 30 | 5 | 30 | 0 | 40 | 10 | 100 | | 10 | | 40 | | 50 | 100 | 400 |
| | Safety | 2 | 5 | 0 | 5 | 2 | 5 | 4 | 15 | | 5 | 2 | 5 | 2 | 10 | 0 | 10 | 0 | 5 | 0 | 15 | 0 | 30 | | 5 | | 15 | | 20 | 6 | 75 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | 15 | 15 | 15 | 20 | 0 | 15 | 0 | 20 | 0 | 5 | 0 | 40 | | 15 | | 5 | | 20 | 17 | 95 |
| | Esthetics | 5 | 20 | 0 | 15 | 5 | 10 | 10 | 45 | | 10 | 10 | 10 | 10 | 20 | 2 | 5 | 0 | 5 | 0 | 5 | 2 | 15 | | 5 | | 15 | | 20 | 22 | 100 |
| Rubbish | Sanitation | 2 | 5 | 0 | 10 | 5 | 10 | 7 | 25 | | 20 | 7 | 15 | 7 | 35 | 2 | 10 | | 10 | | 15 | 2 | 35 | 5 | 10 | 55 | 55 | 60 | 65 | 76 | 160 |
| | Safety | 5 | 15 | 0 | 20 | 5 | 25 | 10 | 60 | | 20 | 23 | 45 | 23 | 65 | 0 | 15 | | 25 | | 25 | 0 | 65 | 0 | 10 | 15 | 25 | 15 | 35 | 48 | 225 |
| | Security | 2 | 5 | 0 | 5 | 0 | 20 | 2 | 30 | | 5 | 15 | 15 | 15 | 20 | 0 | 5 | | 15 | | 10 | 0 | 30 | 0 | 15 | 30 | 30 | 30 | 45 | 47 | 125 |
| | Esthetics | 7 | 15 | 0 | 15 | 7 | 10 | 14 | 40 | | 10 | 10 | 10 | 10 | 20 | 1 | 5 | | 5 | | 5 | 1 | 15 | 0 | 10 | 15 | 15 | 15 | 25 | 40 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 10 | 20 | 5 | 25 | 15 | 60 | | 15 | | 15 | | 30 | 5 | 20 | 0 | 10 | 0 | 15 | 5 | 45 | | 10 | | 15 | | 25 | 20 | 160 |
| | Safety | | 15 | 5 | 20 | 0 | 5 | 5 | 40 | | 15 | | 5 | | 20 | 3 | 15 | 0 | 5 | 0 | 15 | 3 | 35 | | 10 | | 15 | | 25 | 8 | 120 |
| | Security | | 15 | 0 | 5 | 5 | 15 | 5 | 35 | | 5 | | 15 | | 20 | 0 | 10 | 0 | 15 | 0 | 15 | 0 | 40 | | 10 | | 15 | | 25 | 5 | 120 |
| | Esthetics | | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 0 | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 6 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 0 | 10 | 5 | 10 | 7 | 25 | | 15 | | 5 | | 20 | 0 | 5 | | 5 | | 5 | 0 | 15 | 2 | 5 | 25 | 35 | 27 | 40 | 34 | 100 |
| | Safety | 5 | 20 | 0 | 15 | 10 | 20 | 15 | 55 | | 15 | | 20 | | 35 | 0 | 10 | | 10 | | 10 | 0 | 30 | 0 | 5 | 10 | 25 | 10 | 30 | 25 | 150 |
| | Security | 5 | 10 | 0 | 5 | 5 | 15 | 10 | 30 | | 5 | | 10 | | 15 | 0 | 5 | | 10 | | 5 | 0 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 20 | 85 |
| | Esthetics | 5 | 10 | 0 | 5 | 2 | 5 | 7 | 20 | | 5 | | 5 | | 10 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 11 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 0 | 5 | 3 | 15 | 5 | 25 | | 5 | 15 | 15 | 15 | 20 | 2 | 5 | | 5 | | 15 | 2 | 25 | 5 | 10 | 5 | 15 | 10 | 25 | 32 | 95 |
| | Safety | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | 2 | 5 | 2 | 10 | 0 | 5 | | 5 | | 5 | 0 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 7 | 55 |
| | Security | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | 5 | 5 | 5 | 10 | 0 | 5 | | 5 | | 5 | 0 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 7 | 50 |
| | Esthetics | 5 | 15 | 0 | 5 | 2 | 10 | 7 | 30 | | 5 | 10 | 10 | 10 | 15 | 0 | 5 | | 10 | | 5 | 0 | 20 | 0 | 15 | 10 | 20 | 10 | 35 | 27 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | 0 | 10 | 4 | 20 | | 5 | 2 | 10 | 2 | 15 | 0 | 5 | | 5 | 0 | 15 | 0 | 25 | | 5 | | 15 | | 20 | 6 | 80 |
| | Safety | 5 | 10 | 0 | 10 | 0 | 10 | 5 | 30 | | 5 | 5 | 10 | 5 | 15 | 0 | 5 | | 5 | 0 | 10 | 0 | 20 | | 5 | | 10 | | 15 | 10 | 80 |
| | Security | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | 2 | 5 | 2 | 10 | 0 | 5 | | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 2 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 5 | 2 | 5 | 2 | 10 | 2 | 5 | | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 8 | 50 |
| Total | Sanitation | 38 | 135 | 17 | 185 | 53 | 155 | 108 | 475 | | 210 | 64 | 165 | 64 | 375 | 24 | 135 | 10 | 85 | 0 | 165 | 34 | 385 | 17 | 90 | 105 | 350 | 122 | 440 | 328 | 1675 |
| | Safety | 17 | 115 | 5 | 135 | 22 | 85 | 44 | 335 | | 115 | 32 | 110 | 32 | 225 | 20 | 120 | 2 | 70 | 0 | 95 | 22 | 285 | 0 | 55 | 75 | 180 | 75 | 235 | 173 | 1080 |
| | Security | 7 | 80 | 0 | 40 | 54 | 125 | 61 | 245 | | 40 | 37 | 125 | 37 | 165 | 0 | 55 | 10 | 115 | 0 | 60 | 10 | 230 | 0 | 75 | 72 | 210 | 72 | 285 | 180 | 925 |
| | Esthetics | 24 | 85 | 4 | 60 | 34 | 65 | 62 | 210 | | 50 | 32 | 65 | 32 | 115 | 13 | 40 | 5 | 55 | 0 | 45 | 18 | 140 | 0 | 55 | 47 | 100 | 47 | 155 | 159 | 620 |
| TOTAL | | 86 | 415 | 26 | 420 | 163 | 420 | 275 | 1265 | | 415 | 165 | 465 | 165 | 880 | 57 | 350 | 27 | 325 | 0 | 365 | 84 | 1040 | 17 | 275 | 299 | 840 | 316 | 1115 | 840 | 4300 |

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VOL. II OBSERVATIONS OF LOCAL PRACTICES
CHAP. VI JOHN WESLEY HOSPITAL

Page No.

DESCRIPTION OF EXISTING PLANT VI-1
Range of Medical Functions and Specialties VI-1
Plant Services and Population VI-1
Location, Buildings and Land VI-3

CHARACTERISTICS OF THE SOLID WASTE SYSTEM VI-6
Types of Waste Materials Generated VI-6
Brief Description of the Total System VI-7
Responsibility of Solid Waste Management VI-7

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM VI-8
Handling and Storage of Disposable Waste Materials VI-8
Waste Disposal Practices VI-8
Handling and Storage of Reusable Waste Materials VI-9
Quantities and Types of Disposable Waste Materials VI-9
Quantities and Types of Reusable Waste Materials VI-10
Summary of Total Waste Production VI-10
Equipment, Personnel and Contract Services VI-12

OBSERVATIONS OF THE IN-BUILDING SYSTEM VI-13
Handling of Disposable Waste Materials VI-13
Handling of Reusable Waste Materials VI-13
Equipment, Building Area and Personnel Requirements VI-14

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM VI-16

EVALUATION OF EXISTING SYSTEM OPERATION VI-20
The Developed Rating VI-20

Page No.

## LIST OF TABLES

| | | |
|---|---|---|
| VI-1 | Shift Population and Waste Production | VI-2 |
| VI-2 | Summary of Daily Waste Production | VI-11 |
| VI-3 | Daily Requirements for In-Building Waste Handling | VI-15 |
| VI-4 | Estimated Daily Labor Costs of Hospital Solid Waste Systems | VI-17 |
| VI-5 | Distribution of Estimated Annual Costs to Waste System Components | VI-18 |
| VI-6 | Cost Comparison of Disposable and Reusable Wastes | VI-19 |
| VI-7 | Description of Hospital Solid Waste Systems | VI-21 |
| VI-8 | Numerical Rating of Hospital Solid Waste Systems | VI-22 |

## LIST OF FIGURES

| | | |
|---|---|---|
| VI-1 | Site Plan | VI-4 |
| VI-2 | Aerial View of John Wesley Hospital | VI-5 |

## DESCRIPTION OF EXISTING PLANT

John Wesley Hospital, one of the smaller County facilities, primarily serves the residents of the surrounding community and other lawfully admissible patients. It has three specialized medical programs, (1) obstetrical-newborn, (2) cancer chemotherapy, and (3) comprehensive care of liver diseases, all under the jurisdiction of the Directors of these services at the LAC-USC Medical Center.

### Range of Medical Functions and Specialties:

Types of care are generally limited to preventive, diagnostic and therapeutic functions. Plant facilities provide for inpatient and outpatient services. The range of medical care specialties, subspecialties or special categories include:

- Anesthesiology
- Obstetrics/Gynecology
- Obstetrical Surgery
- Pediatrics
- Neonatology
- Internal Medicine
- Cardiology
- Pathology
- Radiology
- Physical Medicine
- Psychiatry/Psychology
- Specialized Surgery

### Plant Services and Population Related to Solid Waste Production:

Present plant services maintained at this facility and staffed by hospital personnel include the Dietary Division, which prepares some 800 meals daily with a staff of 45, the Laundry, which processes about 4,000 pounds of soiled linen per workday with a staff of 18, Housekeeping, Maintenance, Security and Pharmacy.

The Business and Registrar's Divisions provide those administrative functions required in further support of the plant activities. A nursing staff of 123 and 83 aides (attendants) are involved in the various aspects of patient care.

Total plant population at John Wesley, including patients and paid and non-compensated personnel, represent 1,124 persons scheduled over a seven-day week, 24-hour day basis. From daily census records and ordinance personnel lists, this population consists of about 170 bed patients (avg. seven-day basis), 31 outpatients (avg. five-day basis), 682 paid employees and 241 non-compensated workers.

Table VI-1 illustrates the probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE VI-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 170 | 170 | 170 | 170 | 170 | 170 |
| Outpatients | 31 | -- | -- | -- | -- | -- |
| Paid Personnel | 286 | 110 | 110 | 220 | 110 | 110 |
| Non-Comp. Personnel | 121 | 80 | 40 | -- | -- | -- |
| Total Est. Population/Shift | 608 | 360 | 320 | 390 | 280 | 280 |
| Avg. Shift & Daily Pop. | *422 | | | 316 | | |
| Rate of Waste Production:<br>% of Daily Production | 47% | 28% | 25% | 42% | 29% | 29% |

*Includes outpatients weighted 1/2 value

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

Location, Buildings and Land:

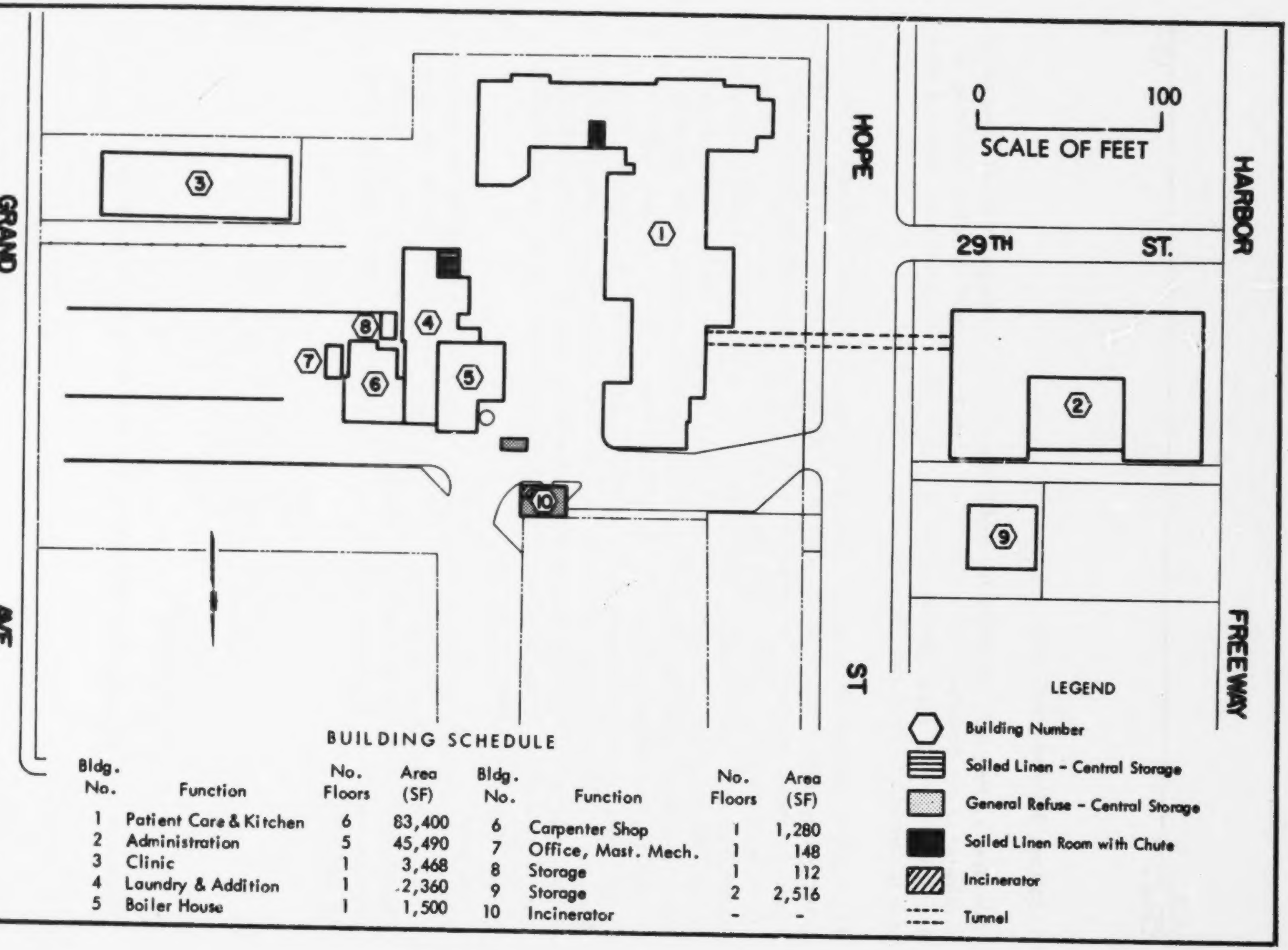
John Wesley Hospital, centrally located in the City of Los Angeles about three miles southwest of the downtown Civic Center, is a relatively small complex consisting of four buildings with a gross building area of about 140,300 square feet. The 3.4 acre site is comprised of two parcels divided by S. Hope Street.

Figure VI-1, the general site plan, identifies these parcels and buildings. The principal building (Bldg. No. 1), a six-story structure of about 83,400 square feet, houses kitchen, cafeteria, laboratories, supply and storage areas in the basement level, with Pharmacy and Business Office on the first floor. The second, third and fourth floors are typical ward floors, with surgery, delivery and x-ray incorporated in the fifth floor configuration. The small one-story frame clinic, laundry building and incinerator, together with parking areas, are adjacent to the main building occupying the northerly parcel. A pedestrian tunnel, running westerly under Hope Street, connects the main building with Philorena Hall (Building No. 2). Formerly a staff residence, *Philorena Hall, a five-story structure, contains about 45,500 square feet in building area and is now being converted for administrative use. Figure VI-2, an aerial view of this plant, further illustrates the relationship of buildings on this site.

Although planning is not firm at this time, continuation of the hospital modernization program is expected. Acquisition of adjacent parcels to provide greater planning flexibility for anticipated expansion is being considered. This building complex, together with land, equipment and vehicles, is presently valued at approximately $2,563,000.

---

*Philorena Hall may also be identified as the Medical Science Building


HARBOR
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9
10

LEGEND

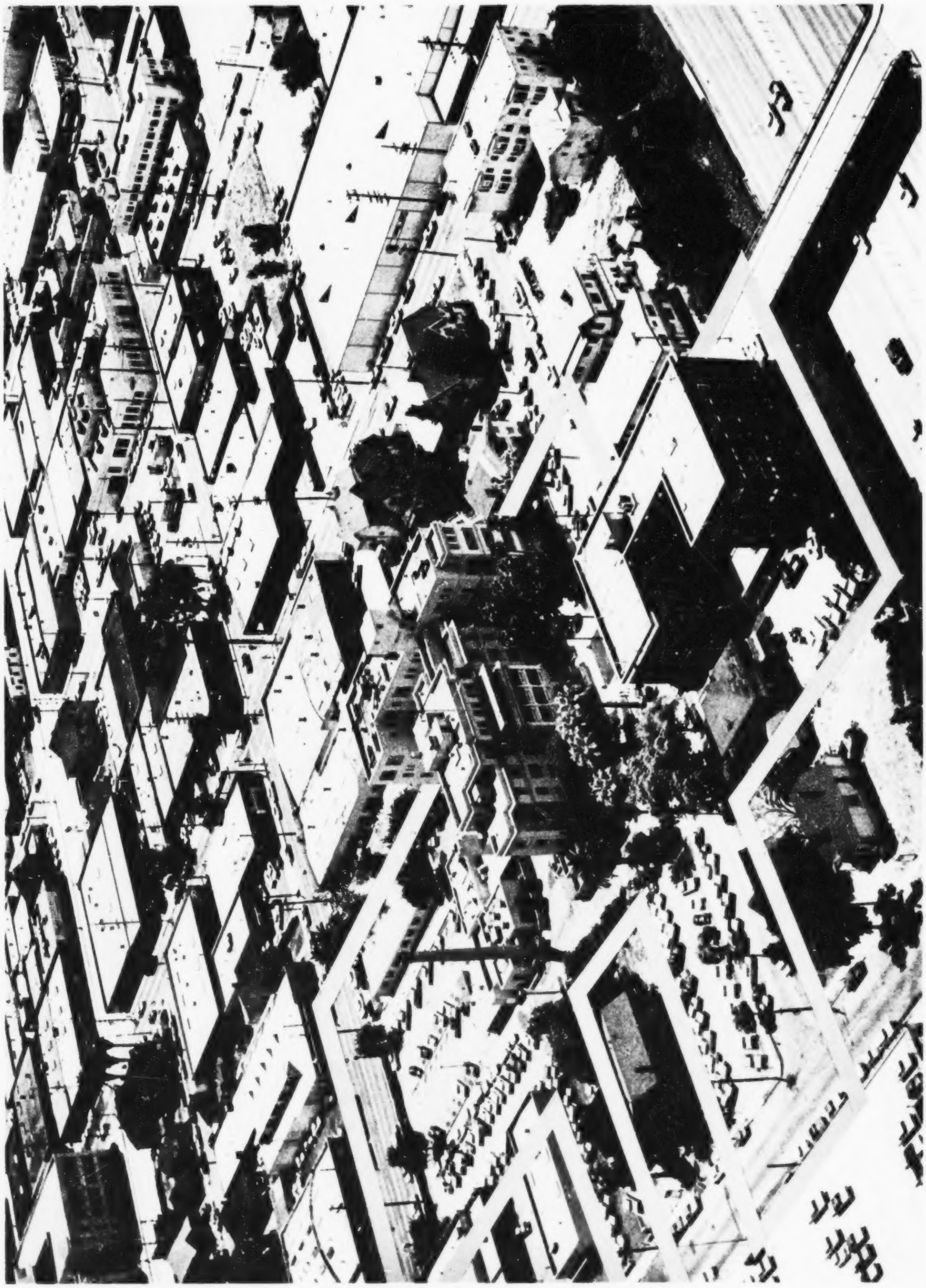
⬡ Building Number
▤ Soiled Linen - Central Storage
▩ General Refuse - Central Storage
■ Soiled Linen Room with Chute
▨ Incinerator
---- Tunnel

BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) | Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|---|---|---|---|
| 1 | Patient Care & Kitchen | 6 | 83,400 | 6 | Carpenter Shop | 1 | 1,280 |
| 2 | Administration | 5 | 45,490 | 7 | Office, Mast. Mech. | 1 | 148 |
| 3 | Clinic | 1 | 3,468 | 8 | Storage | 1 | 112 |
| 4 | Laundry & Addition | 1 | .2,360 | 9 | Storage | 2 | 2,516 |
| 5 | Boiler House | 1 | 1,500 | 10 | Incinerator | - | - |

Site Plan of John Wesley Hospital

FIGURE VI-1



Aerial View of John Wesley Hospital

FIGURE VI-2

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

Limited rehandling of waste materials and relatively short transport distances of the materials from storage to an on-site processing and disposal station are characteristic of the waste system at John Wesley.

### Types of Waste Materials Generated:

Although the types of patients and range of medical care specialties differ considerably from those of the LAC-USC Medical Center, categories of wastes to be found are generally parallel. These categories resolved for detailed studies are limited to the following:

| | |
|---|---|
| 1. Sharps, needles, blades, etc. | (Disposable) |
| 2. Pathological | (Disposable) |
| 3. Soiled linen | (Reusable) |
| 4. Rubbish or mixed refuse | (Disposable) |
| 5. Patient care items | (Reusable) |
| 6. Non-combustible - glass, metals and ashes | (Disposable) |
| 7. Garbage (Non-Grindable) | (Disposable) |
| 8. Food service items | (Reusable) |

These categories basically include food wastes, mixed refuse, segregated non-combustibles, special wastes and reusables. At this plant, pathological wastes are to be found in minimal quantities. Reusables, such as soiled linens, will be found in quantities that exceed the combined amounts of conventional disposable wastes.

Brief Description of the Total System:

Methods of disposal of solid waste materials provided at this facility include grinding of food wastes and certain pathological wastes, incineration of mixed refuse and small animal carcasses, with the balance of disposable wastes transported to landfills by a private refuse contractor.

Conventional hand cart collection of waste materials prevails in the floor activities of the main buildings with storage provided in the ward utility rooms. An institutional laborer collects the accumulated wastes from utility rooms on hand carts and transports the material via elevator, corridor and outside service routes to the incinerator for disposal or to an outside storage bin for later transfer to landfills.

In the main building, soiled linens collected in the wards are bagged and deposited in the chute. The chute fed storage room has access only from the outside of the building. Laundry workers rebag loose materials, load soiled linen carts and transport the material to the laundry-receiving area. Reusable patient items are processed for reuse in the ward utility rooms. Food service items are returned to the central kitchen via corridor and elevator for cleaning.

Responsibility of Solid Waste Management:

General Services is charged with the responsibility of solid waste management. This responsibility is limited to on-site handling of soiled linen and all disposable wastes except pathological materials and small animal carcasses, which are handled by laboratory technicians. Other classifications of personnel, such as food service workers, nurses and nurses' aides (attendants) are involved in the on-floor handling of reusable materials. It is estimated that an equivalent of about 23 full-time employees are involved daily in the handling of solid waste materials at John Wesley.

## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Field observations were conducted during the latter months of 1968 at John Wesley to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

### Handling and Storage of Disposable Waste Materials:

Initial inspections at John Wesley were made to identify the characteristics and functions of the inter-building solid waste system. Figure VI-1 illustrates the building layout of this plant and shows the principal locations for solid waste storage, processing and on-site incineration. Intermediate storage facilities for large accumulations of disposable waste materials are not provided in any of the buildings.

One institutional laborer operates the incinerator and collects the majority of disposable wastes from ward utility rooms in the main building. Bagged and containerized material is collected by hand cart and transported to the central storage bin or incinerator. Collection frequency is variable but as required. Custodians providing service to Philorena Hall deliver accumulations of rubbish direct to the incinerator for disposal.

Non-grindable kitchen wastes (garbage, cans, bottles, etc.) are delivered from the kitchen by food service workers and deposited in the storage bin for later transport to the landfill. Similarly, other segregated wastes, principally non-combustibles, disposable syringes and needles, are deposited in this central storage bin.

### Waste Disposal Practices:

The central storage bin of about three cubic yard capacity is located adjacent to the laundry building in a public parking area at the time of observation. Maintenance of the bin was poor. Hinged covers were bent and generally open. Flies were generally prevalent in the vicinity. Although collection of bin contents is provided twice a week by the refuse contractor, cleaning and sanitation of the bin appear to be infrequent. These wastes collected by the contractor are dumped into the commercial packer truck and transported to a landfill for final disposal.

The small on-site incinerator, also in the vicinity of the laundry building, is located in a fenced enclosure. Collected wastes in tied plastic bags or cans are placed under a covered storage area adjacent to the incinerator. The majority of materials incinerated are handled in an average eight hour period. No air pollution devices or temperature control are installed on this gas-fired incinerator. Charging doors to the combustion chamber generally remain open during the entire burning period. Observation of residue indicates reasonably complete destruction of combustible materials. Residue is also hauled by the refuse contractor to the landfill for disposal.

The small quantities of pathological wastes generated at this facility are deposited in pathology grinder stations. Food preparation wastes are deposited directly into food grinders at kitchen locations.

### Handling and Storage of Reusable Waste Materials:

Soiled linen is removed from the intermediate storage room (main building) by laundry workers, rebagged as required, loaded on carts and transported to the nearby laundry-receiving area for reprocessing. Minor quantities of soiled linen from the other buildings are collected from utility rooms by laundry workers. No other reusable materials were found in the inter-building system.

### Quantities and Types of Disposable Waste Materials:

During September, 1968, a quantity survey of solid wastes was made at John Wesley to determine the types and volumes of disposable materials produced daily in the plant.

Portable scales were used at the incinerator area for weighing of all materials incinerated and placed in storage for landfill disposal. Scale records were developed on all disposable wastes over a six-day period. During this period, typical daily activity involved the collection of about 1,003 pounds of materials for incineration and 248 pounds for landfill disposal. Pathologic wastes were estimated at 115 pounds daily and grindable food wastes were estimated at about 210 pounds.

Collectively, all disposable wastes generated at John Wesley were calculated at 1,350 pounds daily, or equivalent to about 7.9 pounds per bed patient, or 1.2 pounds per capita (based on occupancy of 170 and gross population of 1,124).

### Quantities and Types of Reusable Waste Materials:

The principal identifiable reusable materials to be found in the system include soiled linen and food service items. Total materials processed by the on-site laundry average about 2,900 pounds per calendar day, which is equivalent to about 17 pounds per bed patient day. Reusable food service items were estimated at about 800 pounds daily.

### Summary of Total Waste Production:

In summary, Table VI-2 presents the types and quantities of wastes that may be expected to be generated daily at John Wesley Hospital. The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

TABLE VI-2 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors | |
|---|---|---|---|---|
| | | | Lbs./Bed Patient | Lbs./Capita |
| Sharps, Needles, Etc. | 8 | .2 | TR | TR |
| Path. & Surgical | 115 | 2.2 | .7 | TR |
| Soiled Linen | 2,900 | 57.4 | 17.0 | 2.6 |
| Rubbish | 717 | 14.1 | 4.2 | .6 |
| Reusable Patient Items | - | - | - | - |
| Non-Combustibles | 80 | 1.6 | .5 | TR |
| Garbage (Non-Grindable) | 160 | 3.2 | .9 | TR |
| Food Service Items | 800 | 15.8 | 4.7 | .7 |
| Ash & Residue | 50 | 1.0 | .3 | TR |
| Animal Carcasses | 10 | .2 | TR | TR |
| Food Waste (Grindable) | 210 | 4.2 | 1.2 | .2 |
| TOTAL WASTES | 5,050 | 100.0 | 29.7 | 4.5 |
| Total Disposable | 1,350 | 26.7 | 7.9 | 1.2 |
| Total Reusable | 3,700 | 73.3 | 21.7 | 3.3 |

*Based Avg. Census of 170 Bed Patients Daily and Gross Population of 1,124

Note - Total Production Related to Gross Bldg. Area of 140,300 SF:
Disposables @ 9.6 Lbs./MSF, Reusables @ 26.4 Lbs./MSF
or Total of 36.0 Lbs./MSF Daily.

Equipment, Personnel and Contract Services:

Limited hospital equipment and personnel are involved in operation of the inter-building and off-site system. The equivalent of only one full-time employee is required for the daily movement of disposable wastes, incinerator operation and transport of soiled linen. Hospital equipment utilized in the inter-building system, in addition to the incinerator installation, is limited to various multi-purpose hand carts. Replacement value of the equipment is estimated in a range of $10-$15,000.

Contractor services for other disposable wastes include furnishing one 3 cubic yard closed storage bin, with collection of accumulated wastes two days per week, and hauling and disposal of these materials in a landfill site. Costs of these services are at a rate of $25.00 per month or equivalent to about $0.85 per day. Considering the estimated quantity of 250 pounds per day or 6,500 pounds per month handled under this contract, costs of about $7.70 per ton or $0.004 per pound are incurred for this service.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at John Wesley were made of the functions of the in-building operation (Unit and Inter-Unit System). These observations were directed to the mechanics of handling, handling techniques associated with all types of wastes, equipment used and manpower employed in handling of solid wastes, all in an effort to establish operating standards, efficiencies and a basis of determining costs of the present waste system.

### Handling of Disposable Waste Materials:

Custodians are the principal handlers of disposable waste materials. Wastebaskets and other containers are disinfected daily and lined with plastic bags for reuse. Containers are emptied by removing filled plastic bags and then are deposited in the plastic liner within a suspended cloth bag on the custodial cart. These plastic liners are tied when filled and placed in utility rooms for later collection. Segregated non-combustibles are also collected by custodians and are stored in utility rooms to await collection.

Limited quantities of pathological wastes are immediately placed in identified covered containers upon the creation of the waste material. These containers are temporarily stored in utility rooms to await transport to the grinder station for pathologic wastes. Handling of pathologic materials is limited to laboratory technicians.

Disposable syringes and needles, initially handled by nurses, are placed in lined closed containers and are segregated from other wastes in utility room storage. These materials are collected along with other materials by custodians and transferred to the outside central storage bin.

### Handling of Reusable Waste Materials:

Nurses are the principal handlers of soiled linen at the ward level, including bagging, transport and deposit of these materials in the linen chute. Nurses' aides (attendants) are generally the exclusive handlers of patient care utensils, including reprocessing of this equipment in the ward utility rooms. After meals, attendants and food service workers collect and assemble food service items on food carts. Food service workers transport these carts via corridor and elevator to the central kitchen for cleaning.

Equipment, Building Area and Personnel Requirements:

Principal fixed equipment and building areas used exclusively by the in-building waste system are limited to the soiled linen chute and storage room. Other than custodial and food service carts, relatively no specialized accessory equipment is utilized in the system. Horizontal transport distances to storage points (utility rooms) for the most part are nominal, daily waste accumulations are relatively small, and personnel requirements are minimal.

Observations made to relate daily manpower requirements to the operation of the in-building system indicated an equivalent of some 22 mandays were required for daily operation. Table VI-3, illustrating labor requirements for each type of waste material, was prepared for later comparison to other hospitals under study. The composite time factors (minutes per bed) developed from field observations indicate 62 minutes per bed patient day is devoted to handling of solid wastes in the in-building system.

TABLE VI-3 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| Type of Waste | Manhours by Personnel Classifications<br>Nurses | <br>Aides | <br>Cust. | <br>(1) Other | <br>Total | Equiv. Man Days | Min. Per Bed |
|---|---|---|---|---|---|---|---|
| Sharps | 16.0 | -- | .2 | -- | 16.2 | 2.1 | 5.8 |
| Soiled Linen | 25.0 | -- | -- | -- | 25.0 | 3.1 | 8.8 |
| Patient Care Items | -- | 4.0 | -- | -- | 4.0 | .5 | 1.4 |
| Food Service Items | -- | 35.0 | -- | -- | 35.0 | 4.4 | 12.4 |
| Rubbish | -- | 8.0 | 43.0 | 16.0 | 67.0 | 8.4 | 23.8 |
| Non-Comb. | -- | -- | 13.2 | -- | 13.2 | 1.6 | 4.4 |
| Other (2) | -- | -- | .5 | 15.0 | 15.5 | 1.9 | 5.4 |
| TOTAL | 41.0 | 47.0 | 56.9 | 31.0 | 175.9 | -- | 62.0 |
| Equivalent Man Days | 5.1 | 5.9 | 7.1 | 3.9 | -- | 22.0 | -- |

(1) Laboratory technician and food service workers

(2) Pathological waste, garbage (non-grindable) and food wastes (grindable)

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

The foregoing text described the functions of the relatively simple solid waste system at John Wesley and noted the limited equipment and personnel involved in systems operation. The principal costs of operation as found in all hospital systems under study is that of labor. Labor costs for the total system, including payroll taxes, insurance and social benefits, have been calculated at about $276,432 annually, or $757 per calendar day. Table VI-4 relates types of employees involved in waste handling and the distribution of estimated daily labor costs to the various types of wastes, as well as the components of the total waste system.

The replacement value of building areas and equipment utilized in the waste system is estimated at about $20,000. The average annual cost of these facilities projected over a 35-year period with a nominal interest rate of 5% (average annual amortization rate of 6.107%) results in an average expense of about $1,200 per year or $3.30 per day. A reasonable budget allowance for maintenance and repairs for these facilities should be equal to about 2% of replacement value or some $400 per year or $1.10 per day.

Other readily identifiable cost elements of the system include the contract services for storage bin, collection and disposal at annual costs of $300 or about $0.85 day.

Certain other operating costs lie in the area of the miscellaneous expendable supplies, such as replaceable containers and disposable bags, etc. used throughout the plant. A nominal allowance of $50.00 per day has been established for this factor based on quantities of refuse produced and estimated numbers of containers. A summary of the estimated annual and daily expenses of the system based on the foregoing data is shown in Table VI-5, which also relates these costs to the various components of the waste system.

TABLE VI-4

ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

JOHN WESLEY HOSPITAL

| | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Nurse | $5.72 | 16.0 | $ 91.52 | $ 91.52 | Inst. Lab. | $4.03 | 0.2 | $ 0.81 | $ 0.81 | Inst. Lab. | $4.03 | 0.1 | $ 0.40 | $ 0.40 | | | | | | $ 92.73 |
| Pathological and Surgical | Lab. Tech. | 4.12 | 7.5 | 30.90 | 30.90 | Lab. Tech. | 4.12 | 0.25 | 1.03 | 1.03 | | | | | | | | | | | 31.93 |
| Soiled Linen | Nurse | 5.72 | 25.0 | 143.00 | 143.00 | | | | | | Laund. Wk | 3.25 | 3.0 | 9.75 | 9.75 | | | | | | 152.75 |
| Rubbish | Attendant<br>Custodian | 3.34<br>3.71 | 8.0<br>40.0 | 26.72<br>148.40 | 175.12 | Inst. Lab. | 4.03 | 3.0 | 12.09 | 12.09 | Inst. Lab. | 4.03 | 3.0 | 12.09 | 12.09 | | | | | | 199.30 |
| Reusable Patient Items | Attendant | 3.34 | 4.0 | 13.32 | 13.32 | | | | | | | | | | | | | | | | 13.32 |
| Non-Combustible | Custodian | 3.71 | 12.0 | 44.52 | 44.52 | Inst. Lab. | 4.03 | 1.2 | 4.84 | 4.84 | Inst. Lab. | 4.03 | 0.4 | 16.12 | 16.12 | | | | | | 65.48 |
| Garbage (Non-Grindable) | Fd. Srv. Wk | 3.42 | 4.0 | 13.68 | 13.68 | | | | | | Fd. Srv. Wk | 3.42 | 1.0 | 3.42 | 3.42 | | | | | | 17.10 |
| Food Service Items | Attendant<br>Fd. Srv. Wk | 3.34<br>3.42 | 35.0<br>8.0 | 116.90<br>26.36 | 143.26 | Fd. Srv. Wk | 3.42 | 8.0 | 26.36 | 26.36 | | | | | | | | | | | 169.62 |
| Radiological | | | | | | | | | | | | | | | | | | | | | |
| Ash & Residue | Inst. Lab. | 4.03 | 0.5 | 2.01 | 2.01 | | | | | | Inst. Lab. | 4.03 | 0.2 | 0.81 | 0.81 | | | | | | 2.82 |
| Animal Carcasses | Lab. Tech. | 4.12 | 0.1 | 0.41 | 0.41 | Lab. Tech. | 4.12 | 0.1 | 0.41 | 0.41 | Lab. Tech.<br>Inst. Lab. | 4.12<br>4.03 | 0.2<br>0.1 | 0.82<br>0.40 | 1.22 | | | | | | 2.04 |
| Food Waste (Grindable) | Fd. Srv. Wk | 3.42 | 3.0 | 10.26 | 10.26 | | | | | | | | | | | | | | | | 10.26 |
| | | | | | $668.00 | | | | | $45.54 | | | | | $43.81 | | | | | | $ 757.35 |

TABLE VI-5 DISTRIBUTION OF ESTIMATED ANNUAL COSTS TO WASTE SYSTEM COMPONENTS

| Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | | Average Daily Cost |
|---|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Inter-Building | Off-Site | Total | | |
| | | | | | Cost | % | |
| Bldg. & Fixed Equip. | $ -0- | $ 400 | $ 800 | $-0- | $ 1,200 | .4 | $ 3.30 |
| Maint. & Repairs | -0- | 133 | 267 | -0- | 400 | .1 | 1.10 |
| Disposal Fees | -0- | -0- | -0- | 300 | 300 | .1 | 0.85 |
| Misc. Expend. Supplies | 6,250 | 6,000 | 6,000 | -0- | 18,250 | 6.2 | 50.00 |
| SUB-TOTAL | $ 6,250 | $ 6,533 | $ 7,067 | $300 | $ 20,150 | 6.8 | 55.25 |
| Labor (Taxes, Ins., Benefits) | 243,820 | 16,622 | 15,990 | -- | 276,432 | 93.2 | 757.35 |
| TOTAL | $250,070 | $23,155 | $23,057 | $300 | $296,582 | -- | -- |
| Avg. Cost Per Day | $ 685 | $ 64 | $ 63 | $ 1 | $ -- | -- | $812.60 |
| % of Total | 84.4% | 7.8% | 7.8% | TR | -- | 100.0% | -- |

Collectively all costs of equipment, buildings, etc., exclusive of labor, are slightly less than 7% of the total annual costs of the waste system. It is of interest to note that total annual costs of the waste system are equivalent to 6.3% of the total annual operating budget of John Wesley, which in 1969, was $4,741,000.

Table VI-6 provides a comparison of the respective estimated costs of handling disposable and reusable wastes, excluding only the costs of reprocessing the reusable materials.

TABLE VI-6 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| Type of Waste | Avg. Wt. Lbs./Day | Daily Costs of Handling & Disposal | | | | |
|---|---|---|---|---|---|---|
| | | Labor | *Other | Total | Avg. Cost | |
| | | | | | Per Ton | Per Bed |
| Disposables: | | | | | | |
| Rubbish | 717 | $199 | $30 | $229 | $637 | $1.35 |
| Other | 633 | 222 | - | 222 | 701 | 1.30 |
| Total | 1,350 | $421 | $30 | $451 | $668 | $2.65 |
| Reusables: | | | | | | |
| Soiled Linen | 2,900 | $153 | $26 | $179 | $123 | $1.05 |
| Food Service Items | 800 | 170 | - | 170 | 426 | 1.00 |
| Other | - | 13 | - | 13 | - | .10 |
| Total | 3,700 | $336 | $26 | $362 | $195 | $2.15 |
| Total All Materials | 5,050 | $757 | $56 | $813 | $321 | $4.80 |

*Building, Equipment, Disposal Fees and Misc. Expendable Supplies

## EVALUATION OF EXISTING SYSTEM OPERATION

A summary description of the separate solid waste systems employed at John Wesley is shown in Table VI-7. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site Systems) for each type of waste.

Examination of this summary indicates that on-site movement of wastes relies heavily on manual methods. With the exception of the chute providing vertical transportation for soiled linen, nearly all other material movements involve manpower utilizing a conventional cart system. In evaluation of the existing system, the effectiveness of the preparation of wastes related to sanitation, safety and security during handling and storage was of prime importance. In effect, this evaluation as related to on-site handling is largely an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities. This evaluation also reflects benefits of on-site disposal of the majority of wastes, which eliminates direct exposure to the surrounding environment.

### The Developed Rating:

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Table VI-8 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this Table will indicate that areas where major deficiencies occur are largely limited to on-site storage facilities and off-site landfill disposal.

TABLE VI-7

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

JOHN WESLEY HOSPITAL

| Type of Waste | Av. Daily Weight | % of Total | Unit System |  |  | Inter-Unit System |  | Inter-Building System |  |  | Off-Site System |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 8 | .2 | Lined Closed Container | Manual | Utility Room | Elevator | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Pathological and Surgical | 115 | 2.3 | Closed Container | Manual | Utility Room | Elevator | Refrigerator | --- | --- | --- | Private Contractor | [*]Pharmaceutical Manufacturing |
| Soiled Linen | 2,900 | 57.4 | Cloth Bag | Manual | --- | Gravity Chute | Chute Room | Hand Cart | Open Fenced Area | Laundry | --- | --- |
| Rubbish | 717 | 14.1 | Lined Open Container | Manual | Utility Room | Elevator | --- | Hand Cart | Fenced Area | Incinerator | --- | --- |
| Reusable Patient Items | --- | --- | --- | Manual | Utility Room Autoclave | --- | --- | --- | --- | --- | --- | --- |
| Non-Combustible | 80 | 1.6 | Lined Closed Container | Manual | Utility Room | Elevator | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Garbage (Non-Grindable) | 160 | 3.2 | Open Container | Hand Cart | --- | --- | --- | Hand Cart | Commercial Bin | --- | Private Packer Truck | Landfill |
| Food Service Items | 800 | 15.8 | Plastic Trays | Manual | --- | Elevator | Corridor | Hand Cart | --- | Kitchen | --- | --- |
| Radiological | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ash & Residue | 50 | 1.0 | Closed Container | Manual | --- | --- | --- | --- | Open Area | --- | Private Packer Truck | Landfill |
| Animal Carcasses | 10 | .2 | Paper Wrapping | Manual | --- | Elevator | --- | Manual | --- | Incinerator | --- | --- |
| Food Waste (Grindable) | 210 | 4.2 | Open Container | Manual | Grinder | Sewer | --- | Sewer | --- | --- | Sewer | Sewer Treatment Plant |

[*] The majority of pathological and surgical wastes at this facility are placentae which are used for the manufacture of gamma globulin and research. A small amount of other material is discharged to sewers.

TABLE VI-8

NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

JOHN WESLEY HOSPITAL

| Type of Waste | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing, Disposal | | Def Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 10 | 40 | 15 | 50 | 10 | 20 | 35 | 110 | 35 | 50 | | 20 | 35 | 70 | 25 | 50 | 10 | 10 | | 20 | 35 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 195 | 360 |
| | Safety | 10 | 40 | 10 | 50 | 5 | 10 | 25 | 100 | 25 | 45 | | 10 | 25 | 55 | 5 | 45 | 2 | 5 | | 10 | 7 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 132 | 300 |
| | Security | 5 | 30 | 0 | 5 | 15 | 25 | 20 | 60 | 0 | 5 | | 25 | 0 | 30 | 0 | 5 | 17 | 25 | | 10 | 17 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 97 | 200 |
| | Esthetics | 2 | 5 | 0 | 5 | 2 | 5 | 4 | 15 | 2 | 5 | | 5 | 2 | 10 | 2 | 5 | 2 | 5 | | 3 | 4 | 15 | 0 | 5 | 20 | 30 | 20 | 35 | 30 | 65 |
| Surgical, Pathological & Animals | Sanitation | 5 | 20 | 8 | 35 | 15 | 35 | 28 | 90 | 15 | 20 | 5 | 35 | 20 | 55 | | 10 | | 10 | | 40 | | 60 | 0 | 20 | 0 | 75 | 0 | 95 | 48 | 300 |
| | Safety | 0 | 5 | 0 | 10 | 2 | 5 | 2 | 20 | 2 | 5 | 2 | 10 | 4 | 15 | | 15 | | 10 | | 5 | | 30 | 0 | 5 | 0 | 5 | 0 | 10 | 6 | 75 |
| | Security | 0 | 5 | 0 | 5 | 15 | 35 | 15 | 45 | 0 | 5 | 5 | 35 | 5 | 40 | | 5 | | 20 | | 5 | | 30 | 0 | 10 | 0 | 75 | 0 | 85 | 20 | 200 |
| | Esthetics | 2 | 10 | 2 | 5 | 5 | 15 | 9 | 30 | 2 | 5 | 0 | 15 | 2 | 20 | | 5 | | 15 | | 10 | | 30 | 0 | 5 | 0 | 15 | 0 | 20 | 11 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | | 30 | 65 | 120 | 20 | 80 | 25 | 50 | 45 | 130 | 15 | 30 | 20 | 30 | 10 | 40 | 45 | 100 | | 10 | | 40 | | 50 | 155 | 400 |
| | Safety | 2 | 5 | 0 | 5 | | 5 | 2 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 5 | 10 | 2 | 5 | 0 | 15 | 7 | 30 | | 5 | | 15 | | 20 | 11 | 75 |
| | Security | 2 | 5 | 0 | 5 | | 5 | 2 | 15 | 0 | 5 | 0 | 15 | 0 | 20 | 0 | 15 | 0 | 20 | 0 | 5 | 0 | 40 | | 15 | | 5 | | 20 | 2 | 95 |
| | Esthetics | 15 | 20 | 10 | 15 | | 10 | 25 | 45 | 5 | 10 | 5 | 10 | 10 | 20 | 2 | 5 | 5 | 5 | 0 | 5 | 7 | 15 | | 5 | | 15 | | 20 | 42 | 100 |
| Rubbish | Sanitation | 2 | 5 | 2 | 10 | 5 | 10 | 9 | 25 | 10 | 20 | | 15 | 10 | 35 | 5 | 10 | 0 | 10 | 10 | 15 | 15 | 35 | | 10 | | 35 | | 45 | 34 | 140 |
| | Safety | 5 | 15 | 5 | 20 | 10 | 25 | 20 | 60 | 10 | 20 | | 45 | 10 | 65 | 7 | 15 | 5 | 25 | 15 | 25 | 27 | 65 | | 10 | | 25 | | 35 | 57 | 225 |
| | Security | 2 | 5 | 0 | 5 | 10 | 20 | 12 | 30 | 0 | 5 | | 15 | 0 | 20 | 0 | 5 | 0 | 15 | 0 | 10 | 0 | 30 | | 15 | | 30 | | 45 | 12 | 125 |
| | Esthetics | 5 | 15 | 5 | 15 | 5 | 10 | 15 | 40 | 5 | 10 | | 10 | 5 | 20 | 2 | 5 | 0 | 5 | 2 | 5 | 4 | 15 | | 10 | | 15 | | 25 | 24 | 100 |
| Reusable Patient Items | Sanitation | | 15 | 5 | 20 | 5 | 25 | 10 | 60 | | 15 | | 15 | | 30 | | 20 | | 10 | | 15 | | 45 | | 10 | | 15 | | 25 | 10 | 160 |
| | Safety | | 15 | 5 | 20 | 0 | 5 | 5 | 40 | | 15 | | 5 | | 20 | | 15 | | 5 | | 15 | | 35 | | 10 | | 15 | | 25 | 5 | 120 |
| | Security | | 15 | 0 | 5 | 0 | 15 | 0 | 35 | | 5 | | 15 | | 20 | | 10 | | 15 | | 15 | | 40 | | 10 | | 15 | | 25 | 0 | 120 |
| | Esthetics | | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | | 5 | | 5 | | 10 | 4 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 2 | 10 | 5 | 10 | 9 | 25 | 7 | 15 | | 5 | 7 | 20 | 2 | 5 | 5 | 5 | | 5 | 7 | 15 | 2 | 5 | 15 | 35 | 17 | 40 | 40 | 100 |
| | Safety | 5 | 20 | 3 | 15 | 10 | 20 | 18 | 55 | 7 | 15 | | 20 | 7 | 35 | 5 | 10 | 5 | 10 | | 10 | 10 | 30 | 0 | 5 | 10 | 25 | 10 | 30 | 45 | 150 |
| | Security | 5 | 10 | 0 | 5 | 7 | 15 | 12 | 30 | 0 | 5 | | 10 | 0 | 15 | 0 | 5 | 5 | 10 | | 5 | 5 | 20 | 0 | 5 | 11 | 15 | 11 | 20 | 28 | 85 |
| | Esthetics | 2 | 10 | 2 | 5 | 2 | 5 | 6 | 20 | 2 | 5 | | 5 | 2 | 10 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 14 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 2 | 5 | | 15 | 4 | 25 | | 5 | | 15 | | 20 | 2 | 5 | 3 | 5 | | 15 | 5 | 25 | 5 | 10 | 3 | 15 | 8 | 25 | 17 | 95 |
| | Safety | 0 | 5 | 0 | 5 | | 5 | 0 | 15 | | 5 | | 5 | | 10 | 1 | 5 | 2 | 5 | | 5 | 3 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 8 | 55 |
| | Security | 0 | 5 | 0 | 5 | | 5 | 0 | 15 | | 5 | | 5 | | 10 | 0 | 5 | 2 | 5 | | 5 | 2 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 4 | 50 |
| | Esthetics | 10 | 15 | 0 | 5 | | 10 | 10 | 30 | | 5 | | 10 | | 15 | 2 | 5 | 5 | 10 | | 5 | 7 | 20 | 0 | 15 | 10 | 20 | 10 | 35 | 27 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | | 10 | 4 | 20 | 2 | 5 | 5 | 10 | 7 | 15 | 1 | 5 | | 5 | 0 | 15 | 1 | 25 | | 5 | | 15 | | 20 | 12 | 80 |
| | Safety | 5 | 10 | 0 | 10 | | 10 | 5 | 30 | 1 | 5 | 2 | 10 | 3 | 15 | 1 | 5 | | 5 | 0 | 10 | 1 | 20 | | 5 | | 10 | | 15 | 9 | 80 |
| | Security | 0 | 5 | 0 | 5 | | 5 | 0 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 0 | 5 | | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 2 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 2 | 5 | 2 | 5 | 4 | 10 | 2 | 5 | | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 10 | 50 |
| Total | Sanitation | 53 | 135 | 71 | 185 | 40 | 155 | 164 | 475 | 89 | 210 | 35 | 165 | 124 | 375 | 50 | 135 | 38 | 85 | 20 | 165 | 108 | 385 | 17 | 90 | 98 | 350 | 115 | 440 | 511 | 1675 |
| | Safety | 27 | 115 | 23 | 135 | 27 | 85 | 77 | 335 | 45 | 115 | 6 | 110 | 51 | 225 | 24 | 120 | 16 | 70 | 15 | 95 | 55 | 285 | 0 | 55 | 90 | 180 | 90 | 235 | 273 | 1080 |
| | Security | 14 | 80 | 0 | 40 | 47 | 125 | 61 | 245 | 0 | 40 | 7 | 125 | 7 | 165 | 0 | 55 | 24 | 115 | 0 | 60 | 24 | 230 | 0 | 75 | 73 | 210 | 73 | 285 | 165 | 925 |
| | Esthetics | 38 | 85 | 23 | 60 | 16 | 65 | 77 | 210 | 18 | 50 | 7 | 65 | 25 | 115 | 12 | 40 | 14 | 55 | 2 | 45 | 28 | 140 | 0 | 55 | 32 | 100 | 32 | 155 | 162 | 620 |
| TOTAL | | 132 | 415 | 117 | 420 | 130 | 430 | 379 | 1265 | 152 | 415 | 55 | 465 | 207 | 880 | 86 | 350 | 92 | 325 | 37 | 365 | 215 | 1040 | 17 | 275 | 293 | 840 | 310 | 1115 | 1111 | 4300 |

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VOL. II OBSERVATIONS OF LOCAL PRACTICES

CHAP. VII OLIVE VIEW HOSPITAL

Page No.

DESCRIPTION OF EXISTING PLANT VII-1
  Range of Medical Functions and Specialties VII-1
  Plant Services and Population VII-1
  Location, Buildings and Land VII-3

CHARACTERISTICS OF THE SOLID WASTE SYSTEM VII-7
  Types of Waste Materials Generated VII-7
  Brief Description of the Total System VII-8
  Responsibility of Solid Waste Management VII-8

OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM VII-9
  Handling and Storage of Disposable Waste Materials VII-9
  Waste Disposal Practices VII-9
  Handling and Storage of Reusable Waste Materials VII-10
  Quantities and Types of Disposable Waste Materials VII-10
  Quantities and Types of Reusable Waste Materials VII-11
  Summary of Total Waste Production VII-11
  Equipment and Personnel Requirements VII-13

OBSERVATIONS OF THE IN-BUILDING SYSTEM VII-14
  Handling of Disposable Waste Materials VII-14
  Handling of Reusable Waste Materials VII-15
  Equipment and Personnel Requirements VII-15

ESTIMATED OPERATING COST OF THE TOTAL SYSTEM VII-18

EVALUATION OF EXISTING SYSTEM OPERATION VII-22
  The Developed Rating VII-22

Page No.

## LIST OF TABLES

VII-1 Shift Population and Waste Production VII-2
VII-2 Summary of Daily Waste Production VII-12
VII-3 Daily Requirements for In-Building Waste Handling VII-16
VII-4 Labor Requirements of In-Building Waste System VII-17
VII-5 Estimated Daily Labor Costs of Hospital Solid Waste Systems VII-19
VII-6 Distribution of Estimated Annual Costs to Waste System Components VII-20
VII-7 Cost Comparison of Disposable and Reusable Wastes VII-21
VII-8 Description of Hospital Solid Waste Systems VII-23
VII-9 Numerical Rating of Hospital Solid Waste Systems VII-24

## LIST OF FIGURES

VII-1 Site Plan VII-4
VII-2 Aerial Photograph of Olive View Hospital VII-5
VII-3 Aerial Photograph of New Acute Unit VII-6

## DESCRIPTION OF EXISTING PLANT

Olive View Hospital is a primary center for tuberculosis care and hospitalization for Los Angeles County. It also provides the services for the care of chronic pulmonary diseases and rehabilitation of certain chronic disabling conditions. Olive View, with a present bed capacity of 699, operates at about 80% of capacity.

### Range of Medical Functions and Specialties:

Types of medical care are preventive, diagnostic, therapeutic and rehabilitative. Plant facilities provide for inpatient and outpatient services and for the present, exclude emergency services. The range of medical care specialties, subspecialties and special categories provided include:

- Internal Medicine
- Chest Medicine (Tuberculosis)
- Surgery
- Psychiatry
- Radiology
- Pathology
- Outpatient Clinic

Major plant improvements now underway will provide for (1) expansion of rehabilitation programs in the fields of alcoholic, drug addiction and psychiatrics, (2) establishment of a major acute unit to supplement the LAC-USC Medical Center, (3) expansion of clinic services, (4) establishment of a twenty-four hour emergency service for the community, and (5) establishment of teaching and service affiliation with a local university and medical school. These expansions are planned during the 1970's.

### Plant Services and Population Related to Solid Waste Production:

Plant services maintained at this facility include Dietary, Transportation, Maintenance, Laundry and Housekeeping divisions. A nursing staff of 219 and 481 nurses' aides (attendants) are involved in the various aspects of patient care functions.

Total plant population at Olive View, including patients, paid personnel and volunteer workers, represents some 2,452 persons scheduled over a seven-day week, 24-hour day basis. From daily census records and ordinance personnel lists, this population consists of about 560 bed patients (avg. seven-day basis), 1,642 paid employees and 250 non-compensated workers.

Table VII-1 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE VII-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 560 | 560 | 560 | 560 | 560 | 560 |
| Outpatients | 36 | -- | -- | -- | -- | -- |
| Paid Personnel | 600 | 400 | 200 | 600 | 300 | 200 |
| Non-Comp. Personnel | 125 | 83 | 42 | -- | -- | -- |
| Total Est. Population/Shift | 1,321 | 1,043 | 802 | 1,160 | 860 | 760 |
| Avg. Shift & Daily Pop. | *1,050 | | | 927 | | |
| Rate of Waste Production: % of Daily Production | 41.5% | 32.8% | 25.7% | 41.5% | 31.0% | 27.5% |

*Includes Outpatients weighted 1/2 value

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

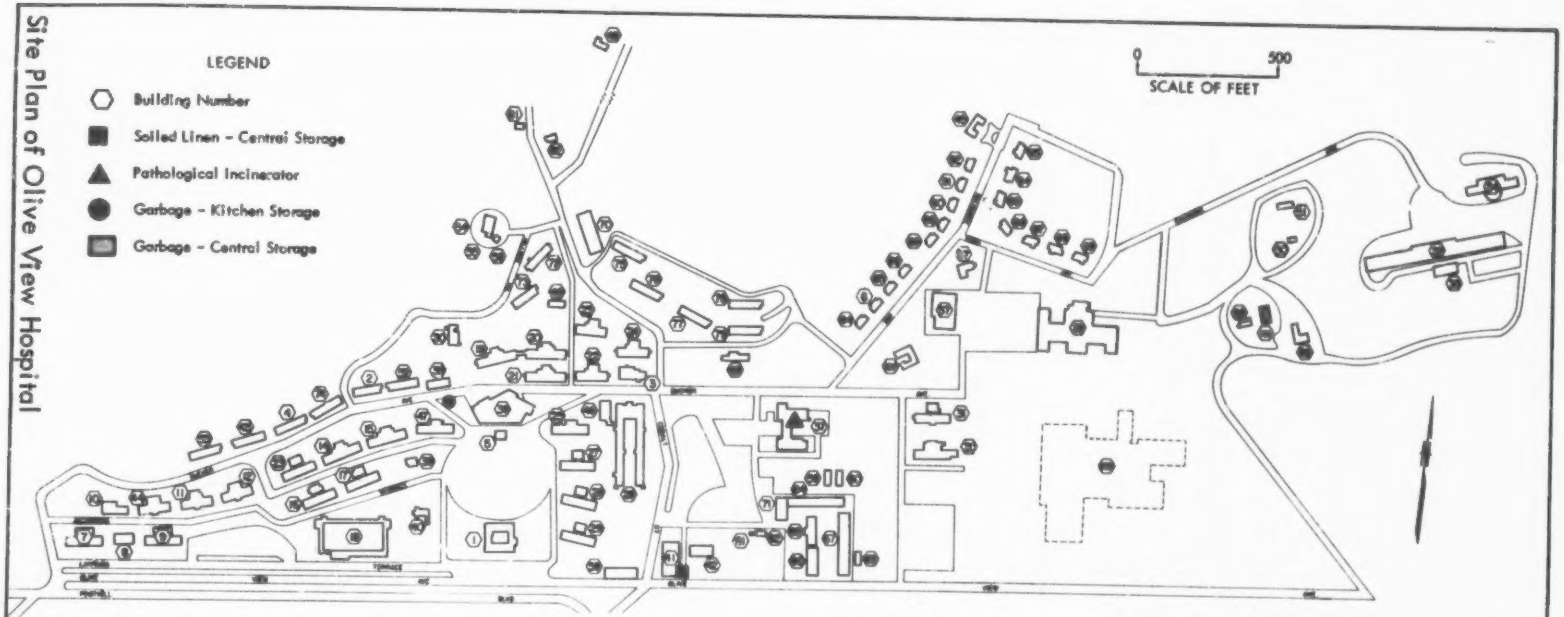
Location, Buildings and Land:

Olive View Hospital is located in the San Fernando Valley of Los Angeles County about 25 miles northwest of the downtown Los Angeles Civic Center. The hospital development occupies an estimated 100 acres of a large County tract in the foothills of the San Gabriel mountains and bordering Foothill Boulevard.

The existing facility in operation, largely obsolete by today's standards, is comprised of about 100 one-story buildings in a community-type development. Collectively, these buildings represent a gross building area of some 500,000 square feet.

An 850-bed hospital is currently under construction at this site for the replacement of the existing facilities. It is anticipated to be operational in the early 1970's. Existing facilities will be partially preserved to supplement ambulatory care facilities.

Figure VII-1, the general site plan, identifies the existing buildings of the old plant and major buildings of the new construction program. Figure VII-2, an aerial photograph, shows the relationship of the newer buildings within this plant. Figure VII-3 shows greater detail of the new acute unit in the foreground, the psychiatric building in the right background, and the new powerhouse, center background.



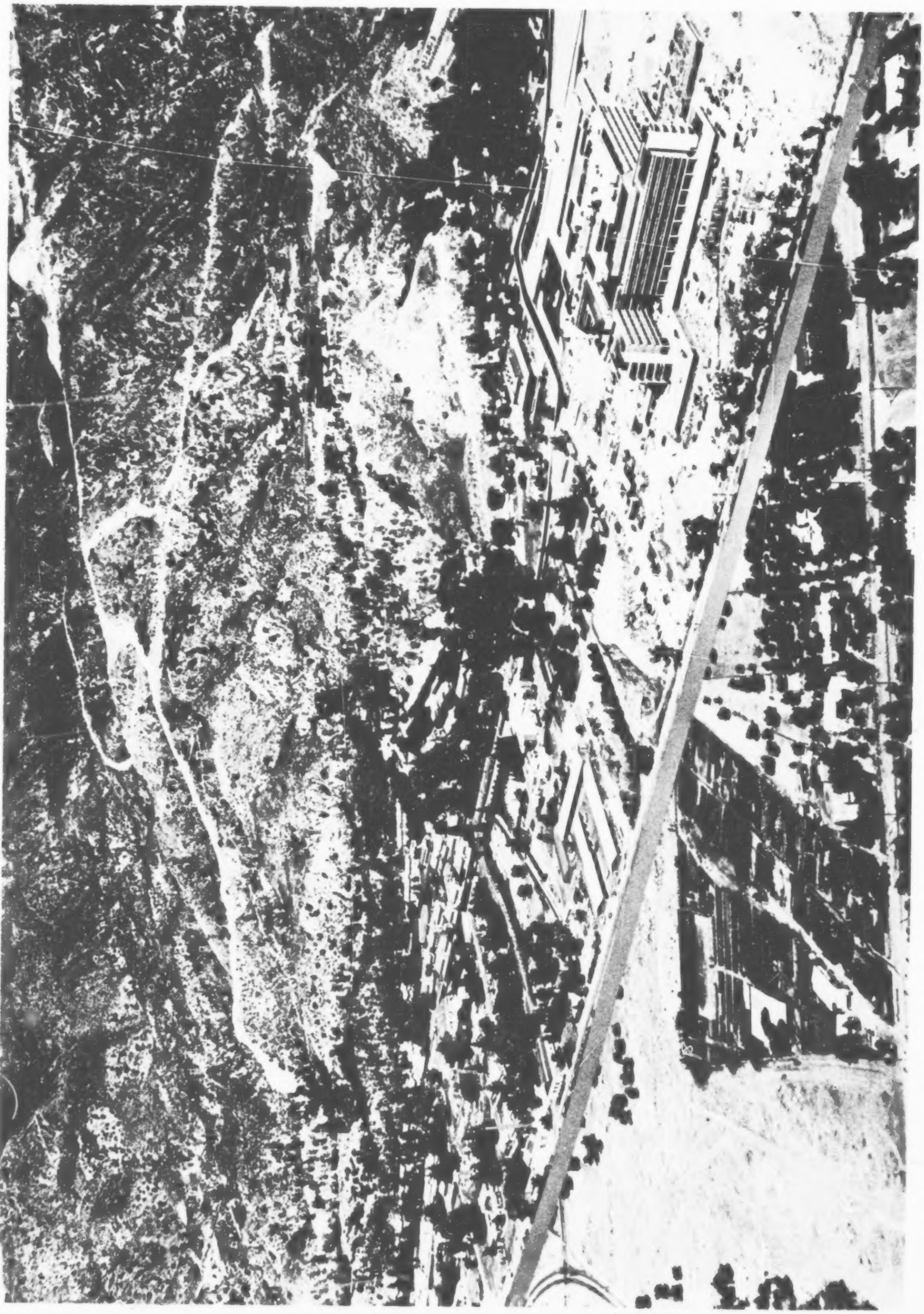
LEGEND
⬡ Building Number
■ Soiled Linen - Central Storage
▲ Pathological Incinerator
● Garbage - Kitchen Storage
▣ Garbage - Central Storage
0 500
SCALE OF FEET
1
2
3

## BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Administration | 2 | 10,834 |
| 2 | Accounting | 2 | 6,060 |
| 3 | Medical Records | 1 | 3,519 |
| 4 | Medical Social Services | 2 | 7,020 |
| 5 | Cashier | 1 | 1,200 |
| 6 | Library | 1 | 1,257 |
| 7-32 | Patient Wards | 1 | 182,562 |
| 33 | Mental Health | 2 | 55,000 |
| 34 | Clinic | 1 | 8,900 |
| 35 | Annex | 1 | 5,392 |
| 36 | Kitchen | 1 | 17,200 |
| 37 | Lab & Vivarium | 2 | 14,537 |
| 38 | Pharmacy | 1 | 1,200 |
| 39 | Post Office | 1 | 2,400 |
| 40 | Chapel | 1 | 1,793 |
| 41 | Laundry | 1 | 7,540 |
| 42 | Linen Room | 2 | 3,824 |
| 43 | Security Offices | 2 | 7,020 |
| 44 | Nursing Education | 1 | 4,830 |
| 45 | School | 1 | 1,500 |
| 46 | Fire Dept. | 1 | 2,947 |
| 47 | Patient Programs | 1 | 4,700 |
| 48 | Cottage Lane Club | 1 | 1,440 |
| 49 | Hill Top House | 1 | 1,105 |
| 50-51 | Children's O.T. | 1 | 1,640 |
| 52 | Volunteers | 2 | 6,444 |
| 53 | Custodial | 2 | 7,020 |
| 54-56 | Transportation | 1 | 3,127 |
| 57 | Power House | 1 | 10,540 |
| 58 | Old Powerhouse | 1 | 4,332 |
| 59-62 | Gardening | 1 | 2,738 |
| 63 | Metal Bldg. | 1 | 994 |
| 64-67 | Maint. Shops | 1 | 17,732 |
| 68 | Incinerator Bldg. | 1 | 600 |
| 69 | Dog Vivarium | 1 | 1,105 |
| 70-71 | Warehouses | 1 | 8,444 |
| 72-73 | Storage | 2 | 12,700 |
| 74-79 | Employee Dorms | 2 | 42,120 |
| 80-99 | Employee Residences | 1 | 30,544 |
| 100 | Apartment | 2 | 5,554 |
| 101 | Can Room | 1 | 640 |
| 102 | Acute Unit | 7 | 555,000 |

Site Plan of Olive View Hospital

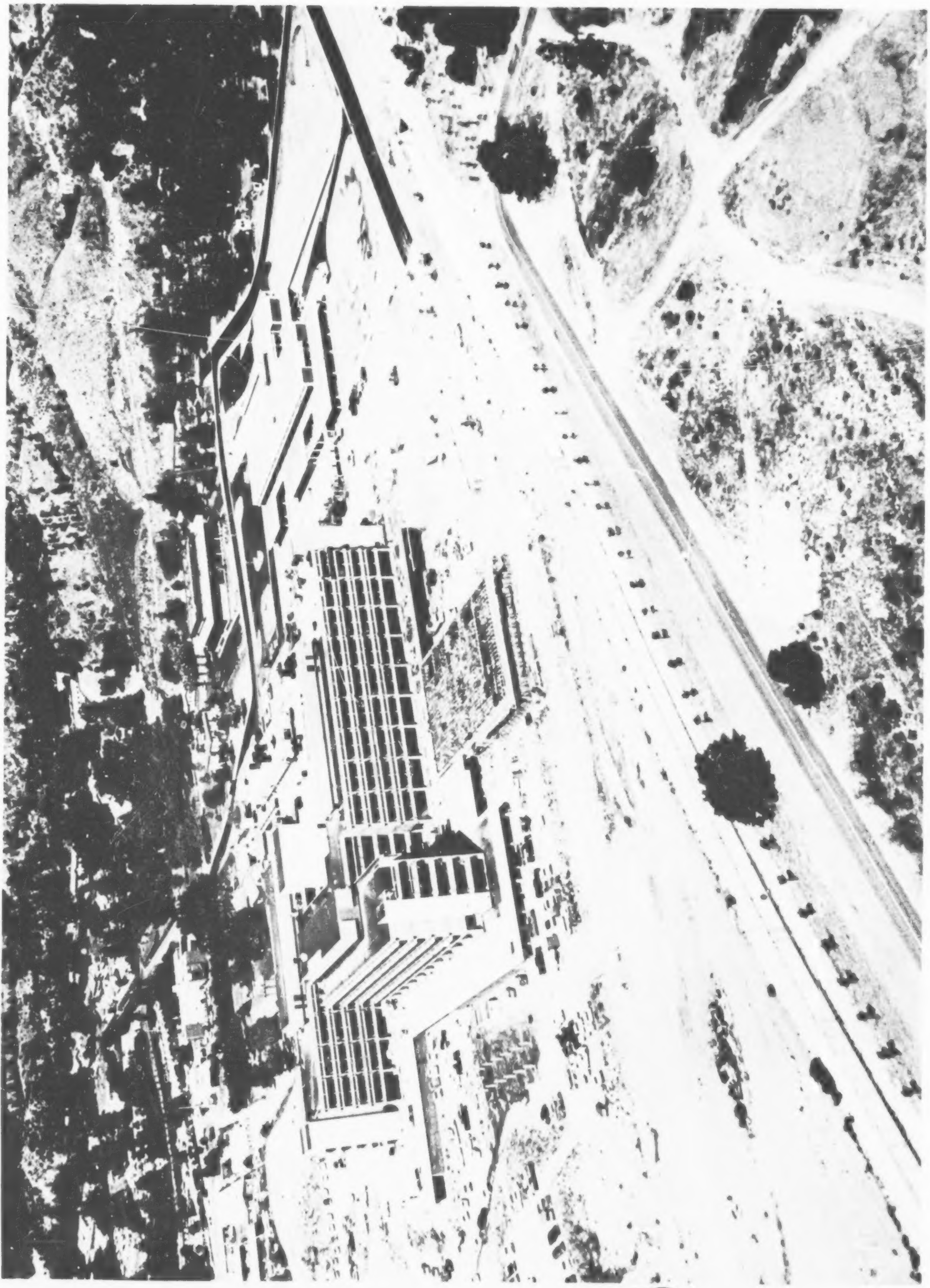
FIGURE VII-1



Aerial Photograph of Olive View Hospital

FIGURE VII-2

Reproduced from best available copy.



Aerial Photograph of New Acute Unit

Reproduced from best available copy.

FIGURE VII-3

## CHARACTERISTICS OF THE SOLID WASTE SYSTEM

The previous description of the existing development is indicative that a relatively simple solid waste system similar to that of a small community may be employed.

### Types of Waste Materials Generated:

Although the types of patients and range of medical care specialties differ considerably from those of the LAC-USC Medical Center, categories of wastes to be found are generally parallel. These categories resolved for detailed studies are limited to the following:

| | |
|---|---|
| 1. Sharps, needles, blades, etc. | (Disposable) |
| 2. Pathological | (Disposable) |
| 3. Soiled linen | (Reusable) |
| 4. Rubbish or mixed refuse | (Disposable) |
| 5. Patient care items | (Reusable) |
| 6. Non-combustible - glass, metals and ashes | (Disposable) |
| 7. Garbage (Non-Grindable) | (Disposable) |
| 8. Food service items | (Reusable) |

These categories basically include garbage, mixed refuse, segregated non-combustibles, special wastes and reusables. At this plant, pathological wastes are to be found in minimal quantities. Reusables, such as soiled linens, will be found in quantities that exceed the combined amounts of conventional disposable wastes.

Brief Description of the Total System:

Methods of on-site disposal for solid wastes at this facility are limited to incineration of pathologic wastes. Transport of the balance of disposable wastes, other than garbage, is made to landfills. Food preparation wastes are segregated at the main kitchen and collected daily by personnel of the County Hog Farm.

Hand cart collection of disposable materials prevails in the floor activities of these buildings. Plastic bagged material is stored in utility rooms until transferred outside for curbside collection by the packer truck.

Soiled linens handled in a similar manner are bagged and also placed outside for curbside collection and transfer to the plant laundry for reprocessing. Handling of food service items is largely confined to the ward service kitchens with only food carts being transported back to the main kitchen by truck. Reusable patient items are cleaned in ward utility rooms and transported by truck to Central Supply for autoclaving as may be required.

Responsibility of Solid Waste Management:

General Services is charged with the responsibility of solid waste management. The Transportation Division provides separate collections of soiled linen, food carts, reusable patient items and all disposable wastes, except food preparation waste. Custodians, laundry workers, food service workers and laboratory technicians are involved in various aspects of waste handling within the buildings in addition to nurses and aides.

## OBSERVATIONS OF THE INTER-BUILDING AND OFF-SITE SYSTEM

Field observations were conducted during the latter months of 1968 at Olive View to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

### Handling and Storage of Disposable Waste Materials:

Initial inspections at Olive View were made to identify the characteristics and functions of the inter-building solid waste system. Figure VII-1 illustrates the building layout of this plant. Each of the buildings in this one-story complex represent a potential of one or more accumulation points for both disposable and reusable wastes, with the network of streets and service drives representing the route of the "curbside" collection of these materials.

A building-to-building type collection service prevailed at the time of the initial observations. In this system, custodial personnel collect accumulated bagged wastes (both mixed refuse and segregated non-combustibles) from utility rooms and transport the material to "curbside" locations for later truck pickup. No protective enclosure or containment for wastes are provided at these locations. Collections by the rear-loading packer truck are twice daily or as may be required. Litter occurring in the loading area is promptly cleared.

A separate collection of pathologic wastes by a laboratory technician is made daily or as required. Animal carcasses are also handled by separate collection.

### Waste Disposal Practices:

Throughout the period of observation, all disposable waste materials, with the exception of pathologic wastes, food preparation wastes and animal carcasses, were hauled by the hospital packer truck to area landfills. The Olive View truck also makes an intermediate stop at the San Fernando Juvenile Hall for collection of rubbish en route to the landfill. Pathologic wastes and animal carcasses are incinerated in the on-site pathologic incinerator. Food preparation wastes are collected by personnel from the County's Wayside Honor Rancho for disposal by hog feeding.

Handling and Storage of Reusable Waste Materials:

A building-to-building collection service is also provided for soiled linen. Bagged materials are transferred from utility rooms to open "curbside" locations by custodians. An open truck is used in the collection and transport of this material to the on-site laundry. Separate truck collections of food carts are made from each of the buildings for transfer to the main kitchen for reprocessing by food service workers. Reusable patient care items are also collected separately for transfer to Central Supply for autoclaving.

Quantities and Types of Disposable Waste Materials:

During November, 1968, a quantity survey of solid wastes was made to determine the types and volumes of disposable materials produced daily in the plant. Portable scales were used on the truck collection routes. Scale records were developed on disposable wastes over a four-day period. During this period, typical activity included the daily servicing of some 40 to 50 locations for the collection of mixed refuse. On the average, about 150 to 200 containers (bags or cans) were handled daily and produced about 51% of the total disposable wastes collected. Separate collections of infectious wastes, sharps and other disposables resulted in relatively insignificant quantities of the individual waste materials. In addition, a separate collection of garbage from wards and the main kitchen produced about 42% of the total disposable wastes collected daily.

Collectively, all disposable wastes generated at Olive View were calculated at 4,376 pounds daily, or equivalent to about 7.8 pounds per bed patient, or 1.8 pounds per capita (based on occupancy of 560 and gross population of 2,452).

### Quantities and Types of Reusable Waste Materials:

The principal identifiable materials to be found in the system and classified in this study as reusable solid wastes consist of soiled linen and food service items. Materials processed by the on-site laundry total about 5,630 pounds daily, or 10 pounds per bed patient per day. Reusable food service items were estimated at about 2,500 pounds daily, based on 1.5 pounds per patient meal. Reusable patient care items were found only in trace amounts in the inter-building system.

### Summary of Total Waste Production:

In summary, Table VII-2 presents the types and quantities of wastes that may be expected to be generated daily at Olive View. The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

## TABLE VII-2 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors | |
|---|---|---|---|---|
| | | | Lbs./Bed Patient | Lbs./Capita |
| Sharps, Needles, Etc. | 20 | .2 | TR | TR |
| Path. & Surgical | 6 | .1 | TR | TR |
| Soiled Linen | 5,630 | 45.1 | 10.0 | 2.3 |
| Rubbish | 1,722 | 13.6 | 3.1 | .7 |
| Reusable Patient Items | TR | TR | TR | TR |
| Non-Combustibles | 250 | 2.0 | .5 | .1 |
| Garbage (Non-Grindable) | 475 | 3.7 | .9 | .2 |
| Food Service Items | 2,500 | 20.0 | 4.5 | 1.0 |
| Ash & Residue | 20 | .2 | TR | TR |
| Animal Carcasses | 23 | .2 | TR | TR |
| Food Waste (Grindable) | 1,860 | 14.9 | 3.3 | .8 |
| TOTAL WASTES | 12,506 | 100.0 | 22.3 | 5.1 |
| Total Disposable | 4,376 | 35.0 | 7.8 | 1.8 |
| Total Reusable | 8,130 | 65.0 | 14.5 | 3.3 |

*Based Avg. Census of 560 Bed Patients Daily and Gross Population of 2,452

Note - Total Production Related to Gross Bldg. Area of 510,054 SF:
Disposables @ 8.6 Lbs./MSF, Reusables @ 15.9 Lbs./MSF
or Total of 24.5 Lbs./MSF Daily.

Equipment and Personnel Requirements:

Limited hospital equipment and personnel are involved in the inter-building and off-site system. The equivalent of three full time employees handle the required daily movements of all disposable wastes. The equivalent of two employees is also required to handle reusable materials. Material handling equipment is limited to hand carts and trucks for inter-building collection and off-site transport requirements. Special equipment for on-site waste disposal is limited to the pathologic incinerator.

## OBSERVATIONS OF THE IN-BUILDING SYSTEM

Continuing observations at Olive View were made of the functions of the in-building operation (Unit and Inter-Unit System). These observations were directed to the mechanics of handling, handling techniques, equipment used and manpower employed in handling of solid wastes, all in an effort to establish operating-standards, efficiencies and a basis of determining costs of the present waste system.

### Handling of Disposable Waste Materials:

Custodians are the principal handlers of disposable waste materials. Wastebaskets and other containers are disinfected daily and lined with plastic bags for reuse. Containers are emptied by removing filled plastic bags and then are deposited in the plastic liner within a suspended cloth bag on the custodial cart. These plastic liners are tied when filled and placed in utility rooms for later collection. Segregated non-combustibles are also collected by custodians and are stored in utility rooms to await collection.

Limited quantities of pathologic wastes are immediately placed in closed containers upon the creation of the waste material. These containers are temporarily stored in utility rooms for later collection by lab technicians and transport to the pathologic incinerator.

Disposable syringes are placed in open lined cans and stored in utility rooms until transferred to "curbside" locations for collection with other mixed refuse.

Garbage resulting from meal service is collected by food service workers, bagged and stored in service kitchens. It is later transferred to an isolated can sterilizing building and stored with other food wastes for daily collection and delivery to the hog farm at Wayside Honor Ranch.

Handling of Reusable Waste Materials:

Nurses' aides (attendants) generally handle the soiled linen, reusable patient care and food service items at the ward level with the assistance of custodians and food service workers as may be required.

Equipment and Personnel Requirements:

Other than custodial and food service carts, relatively no equipment is utilized or required in this simple system. Transport distances to storage points for the most part are reasonable. Personnel requirements appear to be minimal. Observations were made to relate daily manpower requirements to the operation of the in-building system. An equivalent of some 65 mandays was estimated to be required for daily operation. Table VII-3, illustrating labor requirements for each type of waste material, was prepared for comparison to other hospitals under study. The composite time factors (minutes per bed) developed from field observations indicate 55.5 minutes per bed patient day is devoted to handling of solid wastes in the in-building system.

## TABLE VII-3 DAILY REQUIREMENTS FOR IN-BUILDING WASTE HANDLING

| | Manhours by Personnel Classifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type of Waste | Nurses | Aides | Cust. | Food Serv. Wrkr. | (1) Other | Total | Equiv. Man Days | Min. Per Bed |
| Sharps | 4.6 | -- | 1.1 | -- | -- | 5.7 | .7 | .6 |
| Soiled Linen | -- | 140.0 | 11.6 | -- | -- | 151.6 | 19.0 | 16.4 |
| Patient Care Items | -- | 1.5 | -- | -- | -- | 1.5 | .2 | .2 |
| Food Service Items | -- | -- | -- | 84.0 | -- | 84.0 | 10.5 | 9.1 |
| Rubbish | -- | 72.0 | 171.5 | -- | -- | 243.5 | 30.5 | 26.1 |
| Non-Comb. | -- | -- | 2.3 | -- | -- | 2.3 | .3 | .3 |
| Other (2) | .5 | -- | -- | 16.0 | 9.8 | 26.3 | 3.3 | 2.8 |
| TOTAL | 5.1 | 213.5 | 186.5 | 100.0 | 9.8 | 514.9 | -- | 55.5 |
| Equivalent Man Days | .6 | 26.8 | 23.4 | 12.5 | 1.2 | -- | 64.5 | -- |

(1) Laboratory technicians, animal caretakers

(2) Pathological wastes, garbage (non-grindable), food wastes (grindable)

Table VII-4 was prepared to illustrate the manpower load requirements on major personnel classifications involved in the in-building solid waste system. It shows average daily personnel available (7 day basis) and the number and percent required for handling of solid wastes. Further detail on personnel requirements, including labor cost estimates in handling of solid wastes within each of the various components of the system, will be presented at the close of this chapter.

TABLE VII-4 LABOR REQUIREMENTS OF IN-BUILDING WASTE SYSTEM

| Personnel Classification | Man Day Distribution | | |
|---|---|---|---|
| | (1) Total Available | Required for Waste Handling | |
| | | Man Days | % of Total |
| Nurses | 157 | .6 | .3 |
| Nurses' Aides | 345 | 26.8 | 7.8 |
| Custodians | 89 | 23.4 | 26.3 |

(1) 7-Day Basis of Ordinance Positions

## ESTIMATED OPERATING COST OF THE TOTAL SYSTEM

The foregoing text described the functions of the relatively simple solid waste system at Olive View and noted the limited equipment and personnel involved in systems operation. The principal costs of operation as found in all hospital systems under study is that of labor. Labor costs for the total system, including payroll taxes, insurance and social benefits, have been calculated at about $724,160 annually, or $1,984 per calendar day. Table VII-5 relates types of employees involved in waste handling and the distribution of estimated daily labor costs to the various types of wastes, as well as the components of the total waste system.

Other readily identifiable cost elements of the system include such items as the pathologic incinerator, vehicular equipment and disposal fees. Miscellaneous expendables, such as replaceable containers, reusable and disposable bags, etc. used throughout the system, collectively represent cost factors that should be considered. A summary of the estimated annual and daily expense of the system, based on the foregoing data, is shown in Table VII-6, which also relates these costs to the various components of the waste system.

TABLE VII-5

### ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

OLIVE VIEW HOSPITAL

| | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Types of Waste | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./ Day | Emp. Total | Unit System Total | TOTAL |
| Sharps, Needles, Etc. | Nurse<br>Custodian | $5.72<br>3.71 | 4.6<br>1.0 | $ 26.31<br>3.71 | $ 30.02 | Custodian | $3.71 | 0.1 | $ 0.37 | $ 0.37 | Truck Dr.<br>Trans.Wk | $4.74<br>4.12 | 0.1<br>0.1 | $ 0.47<br>0.41 | $ 0.88 | Truck Dr. | $4.74 | 0.1 | $ 0.47 | $ 0.47 | $ 31.74 |
| Pathological and Surgical | Nurse | 5.72 | 0.5 | 2.86 | 2.86 | | | | | | Lab.Tech. | 4.12 | 0.5 | 2.06 | 2.06 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 0.5<br>0.20 | 2.37<br>0.83 | 3.20 | 8.12 |
| Soiled Linen | Attendant | 3.34 | 140.0 | 467.60 | 467.60 | Custodian | 3.71 | 11.6 | 43.04 | 43.04 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 3.0<br>3.0 | 14.22<br>12.36 | 26.58 | | | | | | 537.22 |
| Rubbish | Attendant<br>Custodian | 3.34<br>3.71 | 72.0<br>166.6 | 240.48<br>618.09 | 858.57 | Custodian | 3.71 | 4.9 | 18.18 | 18.18 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 5.0<br>3.2 | 23.70<br>13.18 | 36.88 | Truck Dr. | 4.74 | 1.0 | 4.74 | 4.74 | 918.37 |
| Reusable Patient Items | Attendant | 3.34 | 1.5 | 5.01 | 5.01 | | | | | | Truck Dr.<br>Lab.Tech. | 4.74<br>4.12 | 0.5<br>2.0 | 2.37<br>8.24 | 10.61 | | | | | | 15.62 |
| Non-Combustible | Custodian | 3.71 | 2.0 | 7.42 | 7.42 | Custodian | 3.71 | 0.1 | 0.37 | 0.37 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 0.3<br>0.1 | 1.42<br>0.41 | 1.83 | 10.09 |
| Garbage (Non-Grindable) | Fd.Srv.Wk | 3.42 | 4.0 | 13.68 | 13.68 | Fd.Srv.Wk | 3.42 | 4.0 | 13.68 | 13.68 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 0.4<br>0.2 | 1.65<br>0.82 | 2.47 | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | 30.30 |
| Food Service Items | Fd.Srv.Wk | 3.42 | 84.0 | 287.28 | 287.28 | | | | | | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 6.0<br>6.0 | 28.44<br>24.72 | 53.16 | | | | | | 340.44 |
| Radiological | Lab.Tech. | 4.12 | 0.25 | 1.03 | 1.03 | Lab.Tech. | 4.12 | 0.25 | 1.03 | 1.03 | | | | | | | | | | | 2.06 |
| Ash & Residue | Anim. Caretkr. | 3.51 | 0.5 | 1.76 | 1.76 | | | | | | Truck Dr. | 4.74 | 0.1 | 0.47 | 0.47 | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 0.5<br>0.2 | 2.37<br>0.82 | 3.19 | 5.42 |
| Animal Carcasses | Anim. Caretkr. | 3.51 | 0.5 | 1.76 | 1.76 | Anim. Caretkr. | 3.51 | 0.25 | 0.88 | 0.88 | | | | | | | | | | | 2.64 |
| Food Waste (Grindable) | Fd.Srv.Wk | 3.42 | 16.0 | 54.72 | 54.72 | | | | | | Truck Dr.<br>Trans.Wk | 4.74<br>4.12 | 3.0<br>3.0 | 14.22<br>12.36 | 26.58 | | | | | | 81.30 |
| | | | | | $1731.71 | | | | | $77.55 | | | | | $160.16 | | | | | $ 13.9 | $1983.32 |

TABLE VII-6 DISTRIBUTION OF ESTIMATED ANNUAL COSTS TO WASTE SYSTEM COMPONENTS

| Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | | Average Daily Cost |
|---|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Inter-Building | Off-Site | Total | | |
| | | | | | Cost | % | |
| Bldg. & Fixed Equip. | $ -0- | $ -0- | $ 800 | $ -0- | $ 800 | .11 | $ 2.20 |
| Maint. & Repairs | -0- | -0- | 300 | -0- | 300 | .04 | .80 |
| Vehicular Equip. Carts | -0- | -0- | 1,250 | 250 | 1,500 | .20 | 4.10 |
| Oper. & Maint. | -0- | -0- | 6,250 | 1,250 | 7,500 | 1.00 | 20.60 |
| Disposal Fees | -0- | -0- | -0- | 1,725 | 1,725 | .23 | 4.73 |
| Misc. Expend. Supplies | 8,000 | 600 | 6,000 | -0- | $ 14,600 | 1.95 | 40.00 |
| SUB-TOTAL | $ 8,000 | $ 600 | $14,600 | $3,225 | $ 26,425 | 3.53 | $ 72.43 |
| Labor (Taxes, Ins., Benefits) | $632,180 | $28,470 | $58,400 | $5,110 | $724,160 | 96.47 | $1,984.00 |
| TOTAL | $640,180 | $29,070 | $73,000 | $8,335 | $750,585 | -- | -- |
| Avg. Cost Per Day | $ 1,754 | $ 80 | $ 200 | $ 24 | $ -- | -- | $2,056.43 |
| % of Total | 85.3% | 3.9% | 9.7% | 1.1% | -- | 100.0% | -- |

Collectively all costs, exclusive of labor, are slightly less than 4% of the total annual costs of the waste system. It is of interest to note that total annual costs of the waste system are equivalent to 6.7% of the total annual operating budget of Olive View, which in 1969 was $11,021,000.

Table VII-7 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the costs of reprocessing the reusable materials.

TABLE VII-7 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| Type of Waste | Avg. Wt. Lbs./Day | Daily Costs of Handling & Disposal | | | | |
|---|---|---|---|---|---|---|
| | | | | | Avg. Cost | |
| | | Labor | *Other | Total | Per Ton | Per Bed |
| Disposables: | | | | | | |
| Rubbish | 1,722 | $ 918 | $40 | $ 958 | $1,115 | $1.71 |
| Other | 2,654 | 173 | - | 173 | 129 | .31 |
| Total | 4,376 | $1,091 | $40 | $1,131 | $ 514 | $2.02 |
| Reusables: | | | | | | |
| Soiled Linen | 5,630 | $ 537 | $33 | $ 570 | $ 204 | $1.03 |
| Food Service Items | 2,500 | 340 | - | 340 | 151 | .62 |
| Other | TR | 16 | - | 16 | - | - |
| Total | 8,130 | $ 893 | $33 | $ 926 | $ 229 | $1.65 |
| Total All Materials | 12,506 | $1,984 | $73 | $2,057 | $ 329 | $3.67 |

*Building, Equipment, Disposal Fees and Misc. Expendable Supplies

## EVALUATION OF EXISTING SYSTEM OPERATION

A summary description of the separate solid waste systems employed at Olive View is shown in Table VII-8. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site Systems) for each type of waste.

Examination of this summary indicates that nearly all on-site movement of waste materials is limited to manual methods. In comparison to multistory units, rehandling of materials is somewhat simplified by elimination of vertical transportation requirements. Even so, each material is generally subject to multiple rehandlings between points of generation and ultimate deposit. In evaluation of the existing system, the effectiveness of the preparation of wastes related to sanitation, safety and security during handling and storage was of prime importance. In effect, this evaluation as related to on-site handling is largely an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

### The Developed Rating:

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Table VII-9 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this Table will indicate that areas where major deficiencies occur are largely limited to on-site storage facilities and off-site landfill disposal.

TABLE VII-8 DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS OLIVE VIEW HOSPITAL

| | | | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | Av. Daily Weight | % of Total | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 20 | .2 | Open Lined Can | Manual | Utility Room | --- | Curbside or Ramp | Hospital Packer Truck | --- | --- | Hospital Packer Truck | Private Landfill |
| Pathological and Surgical | 6 | .1 | Plastic Bag | Manual | Surgical Lab | --- | --- | Hospital Vehicle | Pathology Lab | Pathological Incinerator | Hospital Packer Truck | Private Landfill |
| Soiled Linen | 5,630 | 45.1 | Cloth Bag | Manual | Utility Room | --- | Curbside or Ramp | Hospital Truck | Laundry Sorting Area | Laundry | --- | --- |
| Rubbish | 1,722 | 13.6 | Open Lined Can | Hand Cart | Utility Room | --- | Curbside or Ramp | Hospital Packer Truck | --- | --- | Hospital Packer Truck | Private Landfill |
| Reusable Patient Items | --- | --- | Open Plastic Tray | Manual | Utility Room | --- | --- | Hospital Truck | Central Supply | Central Supply Autoclave | --- | --- |
| Non-Combustible | 250 | 2.0 | Open Lined Can | Manual | Utility Room | --- | Curbside or Ramp | Hospital Packer Truck | --- | --- | Hospital Packer Truck | Private Landfill |
| Garbage (Non-Grindable) | 475 | 3.7 | Open Lined Container | Manual | Service Kitchen | --- | Storage Room | Hospital Packer Truck | --- | --- | Hospital Packer Truck | Private Landfill |
| Food Service Items | 2,500 | 20.0 | Food Bin or Cart | Special Cart | Service Kitchen | --- | --- | Hospital Truck | Main Kitchen | Cleanup Area in Kitchen | --- | --- |
| Radiological | TR | TR | Metal Can | Manual | Locked Storage Room | --- | Utility Sink | Sewer | --- | --- | Sewer Line | Sewer Treatment Plant |
| Ash & Residue | 20 | .2 | Closed Metal Can | Manual | Ramp | --- | --- | Hospital Packer Truck | --- | --- | Hospital Packer Truck | Private Landfill |
| Animal Carcasses | 23 | .2 | Closed Metal Can | Manual | Animal Room | --- | Pathological Incinerator | --- | --- | --- | --- | --- |
| Food Waste (Grindable) | 1,860* | 14.9 | Closed Container | Manual | Cleanup Area | --- | Ramp | Hospital Truck | Can Building | --- | Sheriff's Vehicle | Hog Feeding |

*Considerable Moisture Content

TABLE VII-9

NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

OLIVE VIEW HOSPITAL

| Type of Waste | | Unit System: Initial Deposit (Receiver) Def. Value | Unit System: Initial Deposit (Receiver) Max. Value | Unit System: Initial Transfer Def. Value | Unit System: Initial Transfer Max. Value | Unit System: Initial Storage, Processing, Disposal Def. Value | Unit System: Initial Storage, Processing, Disposal Max. Value | Unit System: Def. Value Total | Unit System: Max. Value Total | Inter-Unit System: Vertical Transfer Def Value | Inter-Unit System: Vertical Transfer Max. Value | Inter-Unit System: Intermediate Storage, Processing, Disposal Def. Value | Inter-Unit System: Intermediate Storage, Processing, Disposal Max Value | Inter-Unit System: Def Value Total | Inter-Unit System: Max. Value Total | Inter-Building System: Internal Transfer Def. Value | Inter-Building System: Internal Transfer Max. Value | Inter-Building System: Central Storage Def. Value | Inter-Building System: Central Storage Max. Value | Inter-Building System: Central Processing or Disposal Def. Value | Inter-Building System: Central Processing or Disposal Max. Value | Inter-Building System: Def. Value Total | Inter-Building System: Max. Value Total | Off-Site System: External Transfer Def. Value | Off-Site System: External Transfer Max. Value | Off-Site System: Final Processing and/or Disposal Def. Value | Off-Site System: Final Processing and/or Disposal Max. Value | Off-Site System: Def Value Total | Off-Site System: Max. Value Total | Def Value Total | Max. Value Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sherps, Needles, Etc. | Sanitation | 30 | 40 | 25 | 50 | 10 | 20 | 65 | 110 | | 50 | 20 | 20 | 20 | 70 | 25 | 50 | | 10 | | 20 | 25 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 200 | 360 |
| | Safety | 20 | 40 | 25 | 50 | 5 | 10 | 50 | 100 | | 45 | 10 | 10 | 10 | 55 | 5 | 45 | | 5 | | 10 | 5 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 140 | 300 |
| | Security | 15 | 30 | 0 | 5 | 15 | 25 | 30 | 60 | | 5 | 25 | 25 | 25 | 30 | 0 | 5 | | 25 | | 10 | 0 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 115 | 200 |
| | Esthetics | 5 | 5 | 2 | 5 | 2 | 5 | 9 | 15 | | 5 | 5 | 5 | 5 | 10 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 5 | 20 | 20 | 20 | 25 | 36 | 65 |
| Surgical, Patho-logical & Animals | Sanitation | 5 | 20 | 5 | 35 | 0 | 35 | 10 | 90 | | 20 | | 35 | | 55 | 5 | 10 | 5 | 10 | 0 | 40 | 10 | 60 | 20 | 20 | 75 | 75 | 95 | 95 | 115 | 300 |
| | Safety | 2 | 5 | 5 | 10 | 0 | 5 | 7 | 20 | | 5 | | 10 | | 15 | 5 | 15 | 0 | 10 | 0 | 5 | 5 | 30 | 0 | 5 | 5 | 5 | 5 | 10 | 17 | 75 |
| | Security | 1 | 5 | 0 | 5 | 0 | 35 | 1 | 45 | | 5 | | 35 | | 40 | 0 | 5 | 0 | 20 | 0 | 5 | 0 | 30 | 0 | 10 | 75 | 75 | 75 | 85 | 76 | 200 |
| | Esthetics | 5 | 10 | 2 | 5 | 0 | 15 | 7 | 30 | | 5 | | 15 | | 20 | 2 | 5 | 5 | 15 | 0 | 10 | 7 | 30 | 2 | 5 | 15 | 15 | 17 | 20 | 31 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 35 | 50 | 15 | 30 | 80 | 120 | | 80 | 50 | 50 | 50 | 130 | 10 | 30 | 10 | 30 | 0 | 40 | 20 | 100 | | 10 | | 40 | | 50 | 150 | 400 |
| | Safety | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | 5 | 5 | 5 | 10 | 5 | 10 | 2 | 5 | 0 | 15 | 7 | 30 | | 5 | | 15 | | 20 | 18 | 75 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | 15 | 15 | 15 | 20 | 0 | 15 | 10 | 20 | 0 | 5 | 10 | 40 | | 15 | | 5 | | 20 | 27 | 95 |
| | Esthetics | 15 | 20 | 5 | 15 | 5 | 10 | 25 | 45 | | 10 | 10 | 10 | 10 | 20 | 2 | 5 | 1 | 5 | 0 | 5 | 3 | 15 | | 5 | | 15 | | 20 | 38 | 100 |
| Rubbish | Sanitation | 2 | 5 | 2 | 10 | 5 | 10 | 9 | 25 | | 20 | 15 | 15 | 15 | 35 | 2 | 10 | | 10 | | 15 | 2 | 35 | 5 | 10 | 40 | 55 | 45 | 65 | 71 | 160 |
| | Safety | 7 | 15 | 5 | 20 | 10 | 25 | 22 | 60 | | 20 | 45 | 45 | 45 | 65 | 0 | 15 | | 25 | | 25 | 0 | 65 | 0 | 10 | 15 | 25 | 15 | 35 | 82 | 225 |
| | Security | 2 | 5 | 0 | 5 | 10 | 20 | 12 | 30 | | 5 | 15 | 15 | 15 | 20 | 0 | 5 | | 15 | | 10 | 0 | 30 | 0 | 15 | 20 | 30 | 20 | 45 | 47 | 125 |
| | Esthetics | 7 | 15 | 5 | 15 | 5 | 10 | 17 | 40 | | 10 | 10 | 10 | 10 | 20 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 10 | 10 | 15 | 10 | 25 | 39 | 100 |
| Reusable Patient Items | Sanitation | 10 | 15 | 5 | 20 | 15 | 25 | 30 | 60 | | 15 | | 15 | | 30 | 10 | 20 | 0 | 10 | 0 | 15 | 10 | 45 | | 10 | | 15 | | 25 | 40 | 160 |
| | Safety | 5 | 15 | 5 | 20 | 2 | 5 | 12 | 40 | | 15 | | 5 | | 20 | 3 | 15 | 0 | 5 | 0 | 15 | 3 | 35 | | 10 | | 15 | | 25 | 15 | 120 |
| | Security | 0 | 15 | 0 | 5 | 5 | 15 | 5 | 35 | | 5 | | 15 | | 20 | 0 | 10 | 0 | 15 | 0 | 15 | 0 | 40 | | 10 | | 15 | | 25 | 5 | 120 |
| | Esthetics | 5 | 5 | 2 | 5 | 2 | 5 | 9 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 0 | 5 | 0 | 5 | 2 | 15 | | 5 | | 5 | | 10 | 11 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 2 | 10 | 5 | 10 | 9 | 25 | | 15 | 5 | 5 | 5 | 20 | 2 | 5 | | 5 | | 5 | 2 | 15 | 2 | 5 | 40 | 55 | 42 | 60 | 58 | 120 |
| | Safety | 10 | 20 | 5 | 15 | 10 | 20 | 25 | 55 | | 15 | 20 | 20 | 20 | 35 | 0 | 10 | | 10 | | 10 | 0 | 30 | 0 | 5 | 15 | 25 | 15 | 30 | 60 | 150 |
| | Security | 5 | 10 | 0 | 5 | 7 | 15 | 12 | 30 | | 5 | 10 | 10 | 10 | 15 | 0 | 5 | | 10 | | 5 | 0 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 32 | 85 |
| | Esthetics | 5 | 10 | 2 | 5 | 2 | 5 | 9 | 20 | | 5 | 5 | 5 | 5 | 10 | 1 | 5 | | 5 | | 5 | 1 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 17 | 55 |
| Garbage (Non-Grindable) | Sanitation | 0 | 5 | 0 | 5 | 5 | 15 | 5 | 25 | | 5 | 15 | 15 | 15 | 20 | 2 | 5 | | 5 | | 15 | 2 | 25 | 5 | 10 | 10 | 15 | 15 | 25 | 37 | 95 |
| | Safety | 0 | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | 5 | 5 | 5 | 10 | 2 | 5 | | 5 | | 5 | 2 | 15 | 0 | 5 | 5 | 10 | 5 | 15 | 16 | 55 |
| | Security | 0 | 5 | 0 | 5 | 2 | 5 | 2 | 15 | | 5 | 5 | 5 | 5 | 10 | 0 | 5 | | 5 | | 5 | 0 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 9 | 50 |
| | Esthetics | 5 | 15 | 2 | 5 | 5 | 10 | 12 | 30 | | 5 | 10 | 10 | 10 | 15 | 2 | 5 | | 10 | | 5 | 2 | 20 | 0 | 15 | 10 | 20 | 10 | 35 | 34 | 100 |
| Food Service Items | Sanitation | 0 | 5 | 0 | 5 | 2 | 10 | 2 | 20 | | 5 | | 10 | | 15 | 2 | 5 | 0 | 5 | 0 | 15 | 2 | 25 | | 5 | | 15 | | 20 | 4 | 80 |
| | Safety | 0 | 10 | 2 | 10 | 0 | 10 | 2 | 30 | | 5 | | 10 | | 15 | 2 | 5 | 2 | 5 | 0 | 10 | 4 | 20 | | 5 | | 10 | | 15 | 6 | 80 |
| | Security | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 15 | | 5 | | 5 | | 10 | 0 | 50 |
| | Esthetics | 0 | 5 | 2 | 5 | 2 | 5 | 4 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 5 | | 5 | | 10 | 8 | 50 |
| Total | Sanitation | 79 | 135 | 74 | 185 | 57 | 155 | 210 | 475 | | 210 | 105 | 165 | 105 | 375 | 58 | 135 | 15 | 85 | 0 | 165 | 73 | 385 | 42 | 90 | 245 | 350 | 287 | 440 | 675 | 1675 |
| | Safety | 46 | 115 | 51 | 135 | 31 | 85 | 128 | 335 | | 115 | 85 | 110 | 85 | 225 | 22 | 120 | 4 | 70 | 0 | 95 | 26 | 285 | 0 | 55 | 115 | 180 | 115 | 235 | 354 | 1080 |
| | Security | 23 | 80 | 0 | 40 | 41 | 125 | 64 | 245 | | 40 | 70 | 125 | 70 | 165 | 0 | 55 | 10 | 115 | 0 | 60 | 10 | 230 | 0 | 75 | 167 | 210 | 167 | 285 | 311 | 925 |
| | Esthetics | 47 | 85 | 22 | 60 | 23 | 65 | 92 | 210 | | 50 | 40 | 65 | 40 | 115 | 15 | 40 | 8 | 55 | 0 | 45 | 23 | 140 | 2 | 55 | 57 | 100 | 59 | 155 | 214 | 620 |
| TOTAL | | 195 | 415 | 147 | 420 | 152 | 420 | 494 | 1265 | | 415 | 300 | 465 | 300 | 880 | 95 | 350 | 43 | 325 | 0 | 365 | 132 | 1040 | 44 | 275 | 584 | 840 | 628 | 1115 | 1554 | 4300 |

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VOL. II OBSERVATIONS OF LOCAL PRACTICES

## CHAP. VIII MIRA LOMA COMPLEX

Page No.

DESCRIPTION OF COMPLEX FACILITIES VIII-1

MIRA LOMA HOSPITAL VIII-4
- Types of Waste Materials Generated VIII-6
- Handling of Disposable Waste Materials VIII-7
- Handling of Reusable Waste Materials VIII-8
- Quantities and Types of Disposable Waste Materials VIII-8
- Quantities and Types of Reusable Waste Materials VIII-9
- Summary of Total Waste Production VIII-9
- Equipment, Personnel and Contract Services VIII-11
- Estimated Operating Cost of the Total System VIII-11
- Evaluation of Existing System Operation VIII-14

MIRA LOMA DETENTION FACILITY VIII-18
- Types of Waste Materials Generated VIII-19
- Handling of Waste Materials VIII-19
- Quantities and Types of Waste Materials VIII-19
- Equipment, Personnel and Contract Services VIII-21
- Evaluation of Existing System Operation VIII-21

Page No.

## LIST OF TABLES
## (Mira Loma Hospital)

VIII-1 Shift Population and Waste Production VIII-5
VIII-2 Summary of Daily Waste Production VIII-10
VIII-3 Estimated Daily Labor Costs of Hospital Solid Waste Systems VIII-12
VIII-4 Cost Comparison of Disposable and Reusable Wastes VIII-14
VIII-5 Description of Hospital Solid Waste Systems VIII-16
VIII-6 Numerical Rating of Hospital Solid Waste Systems VIII-17

## LIST OF TABLES
## (Mira Loma Detention Facility)

VIII-7 Shift Population and Waste Production VIII-18
VIII-8 Summary of Daily Waste Production VIII-20
VIII-9 Description of Detention Facility Solid Waste Systems VIII-23
VIII-10 Numerical Rating of Detention Facility Solid Waste Systems VIII-24

## LIST OF FIGURES
## (Mira Loma Complex)

VIII-1 Site Plan VIII-2
VIII-2 Aerial Photograph of Mira Loma Complex VIII-3

## DESCRIPTION OF COMPLEX FACILITIES

The Mira Loma Complex is located in the Antelope Valley in the remote northern section of Los Angeles County about 80 miles north of the downtown Los Angeles Civic Center. Three separate institutions are housed within the Complex, a medical care facility, a rehabilitation center, and a detention facility.

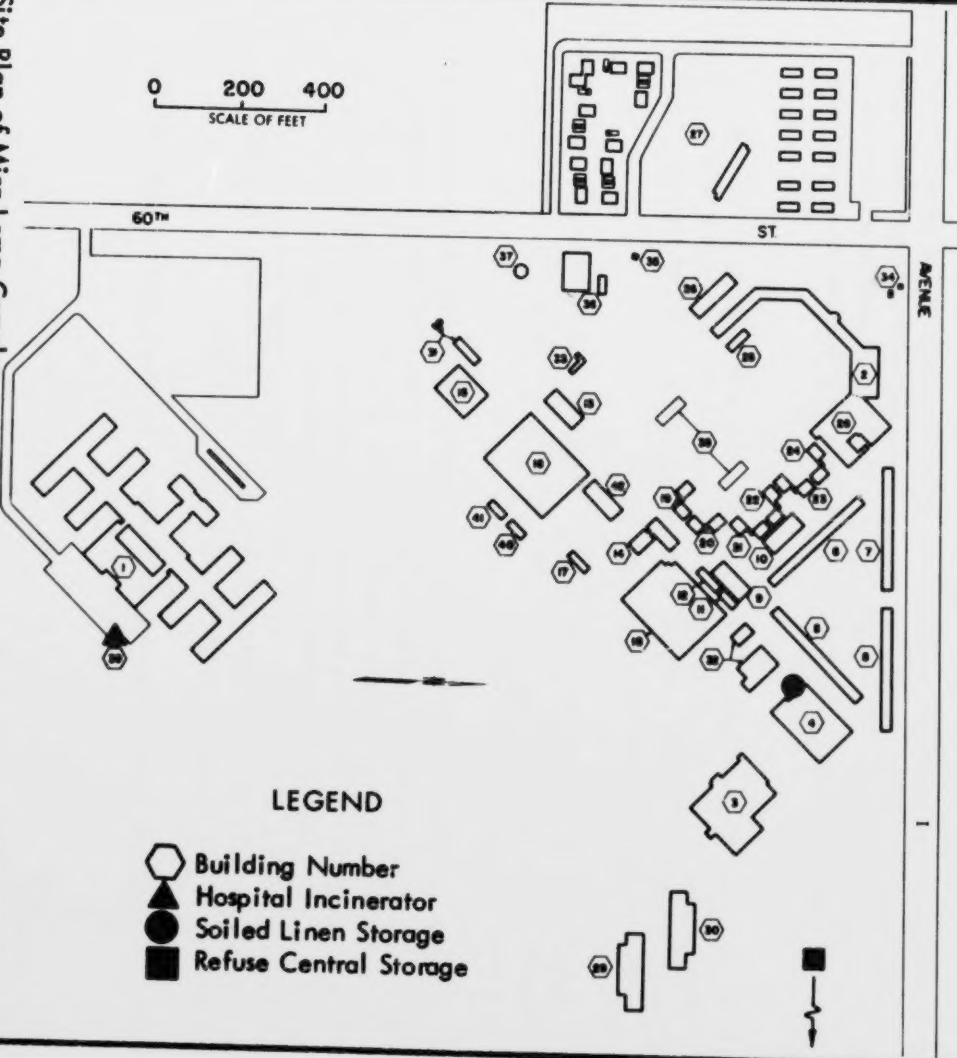
Mira Loma Hospital specializes in providing medical care for recalcitrant tuberculosis patients for both the Sheriff's Department and the Department of Hospitals. This facility also offers generalized hospital care to the Antelope Valley area communities, including Palmdale and Lancaster. Mira Loma Hospital, with a present bed capacity of 232, operates at about 65% capacity, with a staff of 284 paid employees and an average of 25 non-compensated workers, distributed on a 24-hour seven-day week basis.

The Rehabilitation Center basically provides daytime work therapy within the Complex, including gardening, custodial and other plant maintenance duties. This center has a capacity of 276 inmates and operates at about 70% of capacity, with a supervisory staff of 24 full-time day employees.

The Sheriff's facility has a designed capacity of 500 inmates and generally operates above this level. This facility is supervised by a staff of about 134, distributed on a 24-hour seven-day week basis.

The hospital facility is comprised of one one-story multiwing building, housing all hospital functions and having a gross building area of some 90,000 square feet. The Rehabilitation Center and the Sheriff's facility collectively have a gross building area of 268,900 square feet, which is comprised of some 40 one-story buildings plus a complex of employee residence structures. Figure VIII-1, the site plan, identifies all buildings within the Complex. Figure VIII-2, an aerial photograph, emphasizes the remoteness of the location and further illustrates the relationship of the hospital to other buildings in the Complex.

Due to the relatively small size and remoteness of location, certain basic service

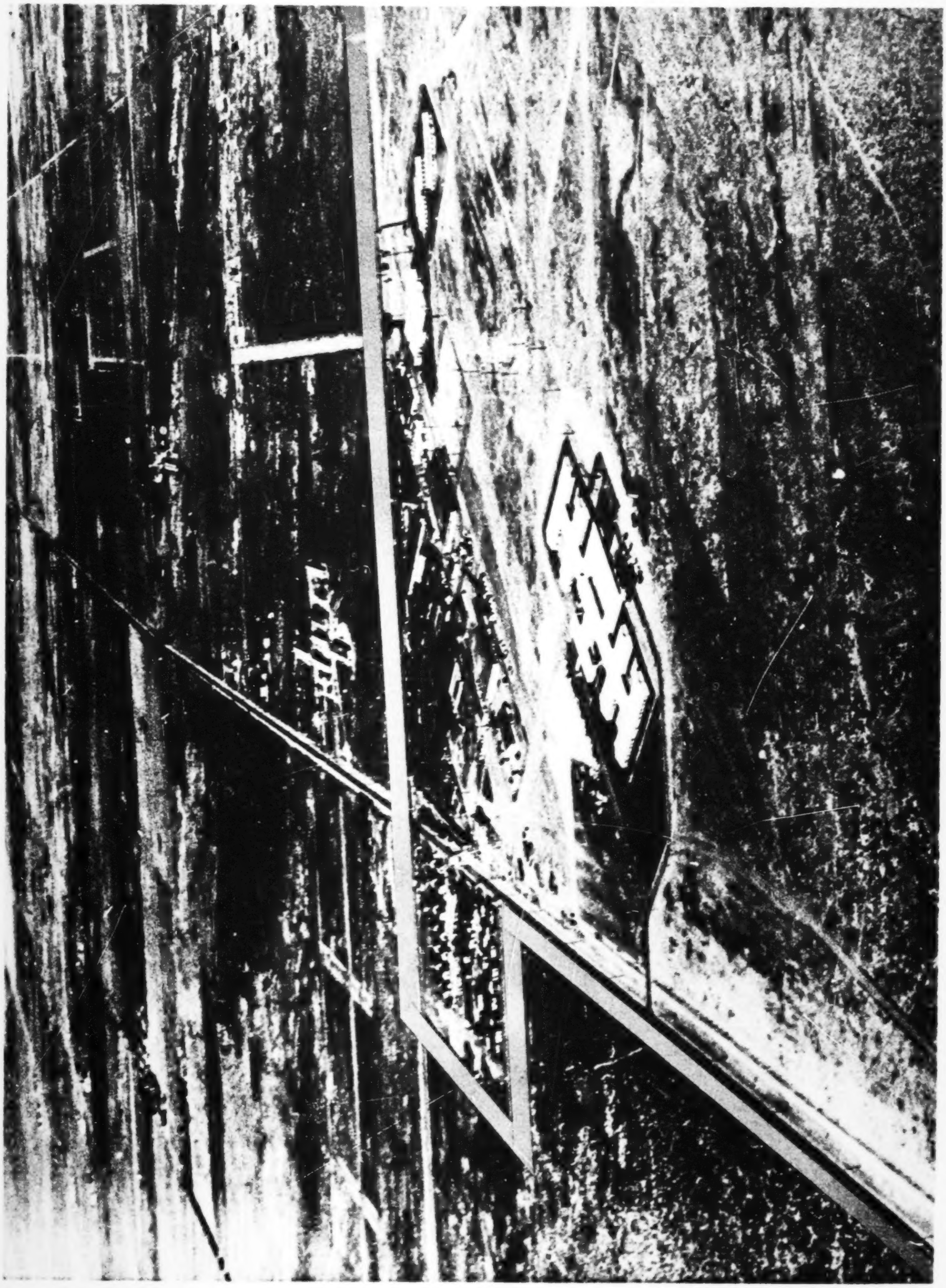

0
200
400
SCALE OF FEET
60TH
ST
AVENUE
I
LEGEND
⬡ Building Number
▲ Hospital Incinerator
● Soiled Linen Storage
■ Refuse Central Storage

Site Plan of Mira Loma Complex

## BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Hospital | 1 | 91,120 |
| 2 | Administration & Infirmary | 1 | 18,000 |
| 3 | Main Kitchen | 1 | 26,600 |
| 4 | Laundry | 1 | 14,000 |
| 5 | Barracks | 1 | 6,768 |
| 6 | Barracks | 1 | 7,008 |
| 7 | Barracks | 1 | 6,762 |
| 8 | Barracks | 1 | 6,762 |
| 9 | Library | 1 | 3,100 |
| 10 | Theater | 1 | 3,800 |
| 11 | Chapel | 1 | 688 |
| 12 | Chapel | 1 | 1,024 |
| 13 | Recreation Hall | 1 | 3,650 |
| 14 | Maximum Security | 1 | 4,160 |
| 15 | Automotive Maint. Shop | 1 | 7,644 |
| 16 | Shop | 1 | 30,800 |
| 17 | Guardhouse | 2 | 5,244 |
| 18 | Shop | 1 | 28,900 |
| 19 | Rehabilitation | 1 | 2,050 |
| 20 | Rehabilitation | 1 | 2,030 |
| 21 | Rehabilitation | 1 | 2,330 |
| 22 | Rehabilitation | 1 | 2,245 |
| 23 | Rehabilitation | 1 | 2,130 |
| 24 | Rehabilitation | 1 | 2,245 |
| 25 | Day Room | 1 | 1,160 |
| 26 | Residence | 1 | 3,900 |
| 27 | 25 Residences & 1 Two-Story Dormitory | - | 31,580 |
| 28 | Storage | 1 | 16,128 |
| 29 | Dorm | 1 | 9,500 |
| 30 | Dorm | 1 | 9,500 |
| 31 | Storage (3) | 1 | 1,500 |
| 32 | Steam Plant | 1 | 900 |
| 33 | Recreation | 1 | 448 |
| 34 | Gatehouse | 1 | 224 |
| 35 | Guard Tower | 1 | 228 |
| 36 | Reservoir | - | - |
| 37 | Water Tank | - | - |
| 38 | Pool (2) | - | - |
| 39 | Hospital Incinerator | - | - |
| 40 | Barracks | 1 | 1,000 |
| 41 | Barracks | 1 | 1,000 |
| 42 | Storage | 1 | 3,840 |

FIGURE VIII-1



Aerial Photograph of Mira Loma Complex

FIGURE VIII-2

facilities, including the laundry and main kitchen, are shared jointly by the institutions. For the most part, the solid waste system of the hospital is operated independently from the system serving the other institutions. For this reason, the hospital is discussed in a separate report, and the Sheriff's facility and rehabilitation center are discussed in a combined report.

## MIRA LOMA HOSPITAL

Types of medical care are preventive, diagnostic, therapeutic and rehabilitative. Plant facilities provide for inpatient and outpatient services, and for the present exclude emergency services. The range of medical care specialties, subspecialties, and special categories include:

- Tuberculosis - recalcitrant patients
- Tuberculosis - jail inmate patients
- Dispensary outpatients
- Acute medical patients
- Radiology
- Pathology
- Dentistry
- Surgery
- Ophthalmology
- Genitourinary
- Orthopedic
- Dermatology
- Bronchoscopy

Although originally designed (with adequate security measures) to handle the Sheriff's Department patient load, this source of patients is decreasing. It is anticipated that in the future this service will be eliminated and all TB patients will be handled at Olive View. It is also expected that future increased size and activity of the rehabilitation program and acute hospital program can be developed, together with establishment of emergency services, and a trauma center with major and minor surgery.

An alternate function for Mira Loma may be considered in the conversion of the entire hospital facility to a major rehabilitation facility for either addicts or alcoholics.

Total plant population at Mira Loma Hospital, including patients, paid employees and volunteer workers, represent some 453 persons. From daily census records and ordinance personnel lists, this population consists of about 144 bed patients (avg. seven-day basis), 284 paid employees and some 25 volunteer workers. A nursing staff of 95 and 58 aides (attendants) are involved in the various aspects of patient care functions.

Table VIII-1 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE VIII-1 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Bed Patients | 144 | 144 | 144 | 144 | 144 | 144 |
| Paid Personnel | 148 | 40 | 40 | 60 | 40 | 40 |
| Non-Comp. Personnel | 12 | 9 | 4 | --- | --- | --- |
| Total Est. Population/Shift | 304 | 193 | 188 | 204 | 184 | 184 |
| Avg. Shift & Daily Pop. | 228 | | | 191 | | |
| Rate of Waste Production: | | | | | | |
| % of Daily Production | 44.4% | 28.2% | 27.3% | 35.6% | 32.2% | 32.3% |

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

Types of Waste Materials Generated:

Although the types of patients and range of medical care specialties differ considerably from the other hospitals under study, categories of wastes to be found are generally parallel. These categories resolved for detailed studies are limited to the following:

| | | |
|---|---|---|
| 1. | Sharps, needles, blades, etc. | (Disposable) |
| 2. | Pathological | (Disposable) |
| 3. | Soiled linen | (Reusable) |
| 4. | Rubbish or mixed refuse | (Disposable) |
| 5. | Patient care items | (Reusable) |
| 6. | Non-combustible - glass, metals and ashes | (Disposable) |
| 7. | Garbage (Non-Grindable) | (Disposable) |
| 8. | Food service items | (Reusable) |

These categories basically include garbage, mixed refuse, segregated non-combustibles, special wastes and reusables. At this plant, pathological wastes are to be found in minimal quantities. Reusables, such as soiled linens, will be found in quantities that exceed the combined amounts of conventional disposable wastes.

Field observations were conducted during the latter months of 1968 at Mira Loma to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes by buildings and/or accumulation points, (3) manpower and equipment used in the handling and disposal of these materials, and (4) methods and practices employed.

Handling of Disposable Waste Materials:

Initial inspections at the hospital were made to identify the characteristics and functions of the solid waste system. Figure VIII-1 illustrates the building layout of this plant and shows the principal locations for solid waste storage, processing and on-site incineration. Intermediate storage facilities for large accumulations of disposable waste materials are not provided in the hospital building.

Facilities for on-site disposal of solid waste at Mira Loma include grinders for food preparation wastes and an incinerator for rubbish. A private refuse contractor furnishes on-site storage bins for all other wastes, and also provides collection service with transport to landfills.

Custodians are the principal handlers of disposable waste materials. Wastebaskets and other containers are disinfected daily and lined with plastic bags for reuse. Containers are emptied by removing filled plastic bags and then are deposited in the plastic liner within a suspended cloth bag on the custodial cart. These plastic liners are tied when filled and placed in hallways for later collection. Segregated non-combustibles are also collected by custodians and are stored in locked utility rooms to await collection.

Limited quantities of pathological wastes are immediately placed in identified open trays upon the creation of the waste material. These materials are autoclaved in ward utility rooms and later deposited in the storage bin for off-site disposal.

Disposable syringes and needles, initially handled by nurses, are placed in lined open trays and are temporarily stored in locked utility rooms. These materials are collected by custodians and transferred to Central Supply for destruction by grinding. The residue is deposited in storage bins for off-site disposal.

The small on-site incinerator, adjacent to the hospital building, is located in a fenced enclosure. Collected wastes in tied plastic bags or cans are placed under a covered storage area adjacent to the incinerator. The majority of materials incinerated are handled during one shift. No air pollution devices or temperature control are installed on this gas-fired incinerator. Charging doors to the combustion chamber generally remain open during the entire burning period. Observation of residue indicates reasonably complete destruction of combustible materials. Residue is also hauled by the refuse contractor to the landfill for disposal.

### Handling of Reusable Waste Materials:

Nurses and aides are the principal handlers of soiled linen at the ward level. They bag and temporarily store this material in adjacent hallways for later collection by laundry workers. The material is delivered by truck to the Complex laundry for reprocessing.

Nurses and aides are generally the exclusive handlers of patient care items at the ward level. Custodians transport this equipment from ward utility rooms to Central Supply for autoclaving as required. Nurses and aides also collect and assemble food service equipment after meals in the adjacent hallways. Food service workers transport the equipment by truck to the main kitchen of the Complex.

### Quantities and Types of Disposable Waste Materials:

During November and December, 1968, a quantity survey of solid wastes was made at Mira Loma Hospital to determine the types and volumes of disposable materials produced daily in the plant. Portable scales were used at the incinerator area for weighing of all materials incinerated and placed in storage for landfill disposal. Scale records were developed on all disposable wastes over an eight day period. During this period, typical daily activity involved the collection of about 360 pounds of materials for incineration and 140 pounds for landfill disposal. Grindable food wastes were estimated at about 150 pounds.

Collectively, all disposable wastes generated at Mira Loma Hospital were calculated at 732 pounds daily, or equivalent to about 5.1 pounds per bed patient, or 1.6 pounds per capita (based on occupancy of 144 and gross population of 453).

Quantities and Types of Reusable Waste Materials:

The principal identifiable reusable materials to be found in the system include soiled linen and food service items. Hospital linens processed by the on-site laundry average about 1,100 pounds per calendar day, or 8 pounds per bed patient day. Reusable food service items were estimated at about 600 pounds daily.

Summary of Total Waste Production:

In summary, Table VIII-2 presents the types and quantities of wastes that may be expected to be generated daily at Mira Loma Hospital. The closing chapter of this volume will provide comparisons with other area hospitals and attempt to establish patterns in the relationship of population, plant size and services to total waste production.

## TABLE VIII-2 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors | |
|---|---|---|---|---|
| | | | Lbs./Bed Patient | Lbs./Capita |
| Sharps, Needles, Etc. | 5 | .1 | TR | TR |
| Path. & Surgical | TR | TR | TR | TR |
| Soiled Linen | 1,120 | 45.6 | 7.8 | 2.5 |
| Rubbish | 362 | 14.8 | 2.5 | .8 |
| Reusable Patient Items | TR | TR | TR | TR |
| Non-Combustibles | 80 | 3.2 | .5 | .2 |
| Garbage (Non-Grindable) | 110 | 4.5 | .7 | .2 |
| Food Service Items | 600 | 24.4 | 4.5 | 1.3 |
| Ash & Residue | 25 | 1.2 | TR | TR |
| Food Waste (Grindable) | 150 | 6.2 | 1.0 | .3 |
| TOTAL WASTES | 2,452 | 100.0 | 17.0 | 5.4 |
| Total Disposable | 732 | 30.0 | 5.1 | 1.6 |
| Total Reusable | 1,720 | 70.0 | 11.9 | 3.8 |

*Based Avg. Census of 144 Bed Patients Daily and Gross Population of 453

Note - Total Production Related to Gross Bldg. Area of 91,120 SF:
Disposables @ 8.2 Lbs./MSF, Reusables @ 18.8 Lbs./MSF
or Total of 27.0 Lbs./MSF Daily.

Equipment, Personnel and Contract Services:

Limited hospital equipment and personnel are involved in operation of the hospital solid waste system. Other than the incinerator, custodial and food service carts, relatively no specialized accessory equipment is utilized in the system. Transport distances to storage points for the most part are nominal, daily waste accumulations are relatively small, and personnel requirements are minimal.

Observations made to relate daily manpower requirements to the operation of the system indicated an equivalent of some 16 mandays were required for daily operation. The composite time factors (minutes per bed) developed from field observations indicate 52 minutes per bed patient day is devoted to handling of solid wastes in the system.

Contractor services for selected wastes include furnishing one 3 cubic yard closed storage bin, collection of accumulated wastes (twice per week), hauling and disposal of these materials in a landfill site. Costs of these services are at a rate of $27.00 per month.

Estimated Operating Cost of the Total System:

The foregoing text described the functions of the relatively simple solid waste system at Mira Loma Hospital and noted the limited equipment and personnel involved in systems operation. The principal costs of operation as found in all hospital systems under study is that of labor. Labor costs for the total system, including payroll taxes, insurance and social benefits, have been calculated at about $166,000 annually, or $455 per calendar day. Table VIII-3 relates types of employees involved in waste handling and the distribution of estimated daily labor costs to the various types of wastes, as well as the components of the total waste system.

The replacement value of equipment exclusively utilized in the waste system is estimated at about $10,000. A reasonable annual cost allowance for depreciation,

TABLE VIII-3

## ESTIMATED DAILY LABOR COSTS OF HOSPITAL SOLID WASTE SYSTEMS

MIRA LOMA HOSPITAL

| Types of Waste | Unit System | | | | | Inter-Unit System | | | | | Inter-Building System | | | | | Off-Site System | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | Type Employee | Pay Rate | Hr./Day | Emp. Total | Unit System Total | |
| Sharps, Needles, Etc. | Nurse | $5.72 | 1.5 | $ 8.58 | $ 8.58 | Custodian<br>Lab Tech. | $3.71<br>4.12 | 0.5<br>0.5 | $1.86<br>2.06 | $ 3.92 | Custodian | $3.71 | 0.5 | $ 1.86 | $ 1.86 | | | | | | $ 14.36 |
| Pathological and Surgical | Lab Tech. | 4.12 | 0.5 | 2.06 | 2.06 | Custodian | 3.71 | 0.5 | 1.86 | 1.86 | | | | | | | | | | | 3.92 |
| Soiled Linen | Nurse<br>Attendant | 5.72<br>3.34 | 4.0<br>25.0 | 22.88<br>83.50 | 106.38 | Laund.Wk | 3.25 | 24.0 | | 78.00 | | | | | | | | | | | 184.38 |
| Rubbish | Attendant<br>Custodian | 3.34<br>3.71 | 10.0<br>18.0 | 33.40<br>66.78 | 100.18 | | | | | | Custodian | 3.71 | 2.0 | 7.42 | 7.42 | | | | | | 107.60 |
| Reusable Patient Items | Nurse<br>Attendant | 5.72<br>3.34 | 1.5<br>3.5 | 8.58<br>11.69 | 20.27 | | | | | | Custodian | 3.71 | 0.5 | 1.86 | 1.86 | | | | | | 22.13 |
| Non-Combustible | Custodian | 3.71 | 1.5 | 5.57 | 5.57 | | | | | | Custodian | 3.71 | 0.5 | 1.86 | 1.86 | | | | | | 7.43 |
| Garbage (Non-Grindable) | Fd.Srv.Wk | 3.42 | 6.0 | 20.52 | 20.52 | | | | | | Custodian | 3.71 | 1.5 | 5.57 | 5.57 | | | | | | 26.09 |
| Food Service Items | Nurse<br>Attendant | 5.72<br>3.34 | 4.0<br>14.0 | 22.88<br>46.76 | 69.64 | | | | | | | | | | | | | | | | 69.64 |
| Radiological | | | | | | | | | | | | | | | | | | | | | |
| Ash & Residue | Custodian | 3.71 | 1.0 | 3.71 | 3.71 | | | | | | | | | | | | | | | | 3.71 |
| Animal Carcasses | | | | | | | | | | | | | | | | | | | | | |
| Food Waste (Grindable) | Fd.Srv.Wk | 3.42 | 4.5 | 15.39 | 15.39 | | | | | | | | | | | | | | | | 15.39 |
| | | | | | $352.30 | | | | | $83.78 | | | | | $ 18.57 | | | | | | $ 454.65 |

maintenance, repair, etc. for this equipment should be equal to about 15% of replacement value or some $1500 per year, or $4.10 per day.

Other readily identifiable cost elements of the system include the contract services for storage bins, collection and disposal at annual costs of about $324 or $0.90 daily. Miscellaneous expendables, such as replaceable containers, reusable and disposable bags, etc., as well as the minimal equipment requirements of the system operation, are estimated at a cost of about $20 daily, or $7,300 annually.

Collectively, all estimated costs in the system operation represent some $175,200 annually or $480 daily, with about 75% allocated to costs for the unit system, 18% to the inter-unit system, 5% to the inter-building system, and 2% in the off-site system.

It is of interest to note that collectively all costs exclusive of labor are slightly more than 5% of the total annual costs of the waste system. It is of equal interest to note that total annual costs of the waste system are equivalent to 8.3% of the total annual operating budget in 1969, which was $2,129,000.

Table VIII-4 provides a comparison of the respective costs of handling disposable and reusable wastes, excluding only the costs of reprocessing the reusable materials.

TABLE VIII-4 COST COMPARISON OF DISPOSABLE AND REUSABLE WASTES

| Type of Waste | Avg. Wt. Lbs./Day | Daily Costs of Handling & Disposal | | | | |
|---|---|---|---|---|---|---|
| | | Labor | *Other | Total | Avg. Cost | |
| | | | | | Per Ton | Per Bed |
| Disposables: | | | | | | |
| Rubbish | 362 | $108 | $25 | $133 | $738 | $0.92 |
| Other | 370 | 71 | - | 71 | 393 | .49 |
| Total | 732 | $179 | $25 | $204 | $567 | $1.41 |
| Reusables: | | | | | | |
| Soiled Linen | 1,120 | $184 | $ - | $184 | $328 | $1.28 |
| Food Service Items | 600 | 70 | - | 70 | 234 | .49 |
| Other | TR | 22 | - | 22 | - | .16 |
| Total | 1,720 | $276 | - | $276 | $322 | $1.93 |
| Total All Materials | 2,452 | $455 | $25 | $480 | $394 | $3.34 |

*Equipment, Contractor Services and Misc. Expendable Supplies

Evaluation of Existing System Operation:

A summary description of the separate solid waste systems employed at Mira Loma Hospital is shown in Table VIII-5. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within each of the system components (Unit, Inter-Unit, Inter-Building and Off-Site

Systems) for each type of waste.

Examination of this summary indicates that on-site movement of wastes relies on manual methods. In evaluation of the existing system, the effectiveness of the preparation of wastes related to sanitation, safety and security during handling and storage was of prime importance. In effect, this evaluation as related to on-site handling is largely an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities. This evaluation also reflects benefits of on-site disposal of rubbish, and less favorable ratings where required off-site disposal permits exposure to the surrounding environment.

Emphasis should be made to the reader that this evaluation was made of prevailing conditions in the described system during a specified period of time. Conditions will and do vary with time, and only through continuing observations over a period of several weeks, supplemented with necessary spot checking of selected areas, was this evaluation assembled.

This evaluation of the total system was based on prevailing practices during observations in the latter months of 1968 and early 1969. Table VIII-6 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. Proper interpretation of individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this Table will indicate that areas where major deficiencies occur are largely limited to on-site storage facilities and off-site landfill disposal.

TABLE VIII-5

## DESCRIPTION OF HOSPITAL SOLID WASTE SYSTEMS

MIRA LOMA HOSPITAL

| Type of Waste | Av. Daily Weight | % of Total | Unit System | | | Inter-Unit System | | Inter-Building System | | | Off-Site System | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial Deposit (Receiver) | Initial Transfer | Initial Storage, Processing, Disposal | Vertical Transfer | Intermediate Storage, Processing, Disposal | Internal Transfer | Central Storage | Central Processing or Disposal | External Transfer | Final Processing and/or Disposal |
| Sharps, Needles, Etc. | 5 | .1 | Open Tray | Manual | Locked Medicine Room | --- | Central Supply | Manual | Custodian Utility Room | Grinder | Vendor's Truck | Landfill |
| Pathological and Surgical | TR | TR | Open Tray | Manual | Autoclave | --- | Fenced Area Next to Incin. | Sheriff's Truck | Vendor's Bins-Back Lot | --- | Vendor's Truck | Landfill |
| Soiled Linen | 1,120 | 45.6 | Cloth Hampers | Manual | Hallway | --- | Hallway | --- | --- | --- | Sheriff's Truck | Laundry |
| Rubbish | 362 | 14.8 | Lined Cans | Hand Cart | Hallway | --- | --- | Hand Cart | Fenced Area Next to Incin. | Hospital Incinerator | --- | --- |
| Reusable Patient Items | --- | --- | Open Tray | Manual | Utility Room | --- | --- | Manual | Central Supply Utility Room | Autoclave | --- | --- |
| Non-Combustible | 80 | 3.2 | Open Tray | Manual | Locked Medicine Room | --- | Central Supply | Manual | Custodian Utility Room | --- | Vendor's Truck | Landfill |
| Garbage (Non-Grindable) | 110 | 4.5 | Open Lined Barrels | Manual | Corridor | --- | --- | Manual | Fenced Area Next to Incin. | Hospital Incinerator | --- | --- |
| Food Service Items | 600 | 24.4 | Plastic Tray | Manual | Hallway | --- | --- | --- | --- | --- | Sheriff's Truck | Kitchen |
| Radiological | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ash & Residue | 25 | 1.2 | Open Container | Manual | Fenced Area | --- | --- | Sheriff's Truck | Commercial Bin | --- | Vendor's Truck | Landfill |
| Animal Carcasses | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Food Waste (Grindable) | 150 | 6.2 | Kitchen Garbage Grinders | Sewer | --- | Sewer | --- | Sewer | --- | --- | Sewer | Sewage Treatment Plant |

TABLE VIII-6

## NUMERICAL RATING OF HOSPITAL SOLID WASTE SYSTEMS

**MIRA LOMA HOSPITAL**

| | | Unit System | | | | | | | | Inter-Unit System | | | | | | Inter-Building System | | | | | | | | Off-Site System | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial Deposit (Receiver) | | Initial Transfer | | Initial Storage, Processing, Disposal | | Def. Value Total | Max. Value Total | Vertical Transfer | | Intermediate Storage, Processing Disposal | | Def Value Total | Max. Value Total | Internal Transfer | | Central Storage | | Central Processing or Disposal | | Def. Value Total | Max. Value Total | External Transfer | | Final Processing and/or Disposal | | Def. Value Total | Max. Value Total | Def. Value Total | Max. Value Total |
| Type of Waste | | Def Value | Max. Value | Def Value | Max. Value | Def. Value | Max. Value | | | Def Value | Max. Value | Def. Value | Max Value | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | | | Def. Value | Max. Value | Def. Value | Max. Value | | | | |
| Sharps, Needles, Etc. | Sanitation | 10 | 40 | 10 | 50 | 5 | 20 | 25 | 110 | | 50 | 5 | 20 | 5 | 70 | 25 | 50 | 5 | 10 | 5 | 20 | 35 | 80 | 10 | 20 | 80 | 80 | 90 | 100 | 155 | 360 |
| | Safety | 10 | 40 | 10 | 50 | 0 | 10 | 20 | 100 | | 45 | 0 | 10 | 0 | 55 | 12 | 45 | 2 | 5 | 2 | 10 | 16 | 60 | 0 | 10 | 75 | 75 | 75 | 85 | 111 | 300 |
| | Security | 0 | 30 | 0 | 5 | 0 | 25 | 0 | 60 | | 5 | 0 | 25 | 0 | 30 | 0 | 5 | 5 | 25 | 0 | 10 | 5 | 40 | 0 | 10 | 60 | 60 | 60 | 70 | 65 | 200 |
| | Esthetics | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 5 | 0 | 5 | 0 | 10 | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | 0 | 5 | 20 | 20 | 20 | 25 | 30 | 65 |
| Surgical, Pathological & Animals | Sanitation | 5 | 20 | 5 | 35 | 0 | 35 | 10 | 90 | | 20 | 0 | 35 | 0 | 55 | 0 | 10 | 0 | 10 | | 40 | 0 | 60 | 0 | 20 | 40 | 75 | 40 | 95 | 50 | 300 |
| | Safety | 2 | 5 | 0 | 10 | 0 | 5 | 2 | 20 | | 5 | 5 | 10 | 5 | 15 | 5 | 15 | 5 | 10 | | 5 | 10 | 30 | 0 | 5 | 0 | 5 | 0 | 10 | 17 | 75 |
| | Security | 0 | 5 | 0 | 5 | 0 | 35 | 0 | 45 | | 5 | 15 | 35 | 15 | 40 | 2 | 5 | 20 | 20 | | 5 | 22 | 30 | 5 | 10 | 75 | 75 | 80 | 85 | 117 | 200 |
| | Esthetics | 2 | 10 | 2 | 5 | 10 | 15 | 14 | 30 | | 5 | 12 | 15 | 12 | 20 | 2 | 5 | 7 | 15 | | 10 | 9 | 30 | 2 | 5 | 10 | 15 | 12 | 20 | 47 | 100 |
| Soiled Linen | Sanitation | 30 | 40 | 10 | 50 | 22 | 30 | 62 | 120 | | 100 | 35 | 50 | 35 | 130 | | 30 | | 30 | | 40 | | 100 | 2 | 10 | 0 | 40 | 2 | 50 | 99 | 400 |
| | Safety | 2 | 5 | 0 | 5 | 5 | 5 | 7 | 15 | | 5 | 5 | 5 | 5 | 10 | | 10 | | 5 | | 15 | | 30 | 2 | 5 | 0 | 15 | 2 | 20 | 14 | 75 |
| | Security | 2 | 5 | 0 | 5 | 5 | 5 | 7 | 15 | | 5 | 15 | 15 | 15 | 20 | | 15 | | 20 | | 5 | | 40 | 0 | 15 | 0 | 5 | 0 | 20 | 22 | 95 |
| | Esthetics | 15 | 20 | 5 | 15 | 10 | 10 | 30 | 45 | | 10 | 10 | 10 | 10 | 20 | | 5 | | 5 | | 5 | | 15 | 2 | 5 | 0 | 15 | 2 | 20 | 42 | 100 |
| Rubbish | Sanitation | 2 | 5 | 5 | 10 | 10 | 10 | 17 | 25 | | 20 | | 15 | | 35 | 2 | 10 | 10 | 10 | 0 | 15 | 12 | 35 | | 10 | | 25 | | 35 | 29 | 130 |
| | Safety | 5 | 15 | 5 | 20 | 17 | 25 | 27 | 60 | | 20 | | 45 | | 65 | 3 | 15 | 13 | 25 | 0 | 25 | 16 | 65 | | 10 | | 25 | | 35 | 43 | 225 |
| | Security | 2 | 5 | 0 | 5 | 20 | 20 | 22 | 30 | | 5 | | 15 | | 20 | 0 | 5 | 5 | 15 | 0 | 10 | 5 | 30 | | 15 | | 30 | | 45 | 27 | 125 |
| | Esthetics | 7 | 15 | 5 | 15 | 10 | 10 | 22 | 40 | | 10 | | 10 | | 20 | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 10 | | 15 | | 25 | 26 | 100 |
| Reusable Patient Items | Sanitation | 10 | 15 | 5 | 20 | 7 | 25 | 22 | 60 | | 15 | | 15 | | 30 | 5 | 20 | 5 | 10 | 0 | 15 | 10 | 45 | | 10 | | 15 | | 25 | 32 | 160 |
| | Safety | 5 | 15 | 5 | 20 | 0 | 5 | 10 | 40 | | 15 | | 5 | | 20 | 3 | 15 | 0 | 5 | 0 | 15 | 3 | 35 | | 10 | | 15 | | 25 | 13 | 120 |
| | Security | 0 | 15 | 0 | 5 | 7 | 15 | 7 | 35 | | 5 | | 15 | | 20 | 0 | 10 | 0 | 15 | 0 | 15 | 0 | 40 | | 10 | | 15 | | 25 | 7 | 120 |
| | Esthetics | 2 | 5 | 2 | 5 | 2 | 5 | 6 | 15 | | 5 | | 5 | | 10 | 2 | 5 | 2 | 5 | 0 | 5 | 4 | 15 | | 5 | | 5 | | 10 | 10 | 50 |
| Non-Combustible | Sanitation | 2 | 5 | 2 | 10 | 5 | 10 | 9 | 25 | | 15 | 2 | 5 | 2 | 20 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 2 | 5 | 28 | 85 | 30 | 90 | 45 | 150 |
| | Safety | 5 | 20 | 3 | 15 | 10 | 20 | 18 | 55 | | 15 | 10 | 20 | 10 | 35 | 5 | 10 | 5 | 10 | | 10 | 10 | 30 | 0 | 5 | 10 | 25 | 10 | 30 | 48 | 150 |
| | Security | 5 | 10 | 0 | 5 | 15 | 15 | 20 | 30 | | 5 | 2 | 10 | 2 | 15 | 0 | 5 | 10 | 10 | | 5 | 10 | 20 | 0 | 5 | 10 | 15 | 10 | 20 | 42 | 85 |
| | Esthetics | 5 | 10 | 2 | 5 | 2 | 5 | 9 | 20 | | 5 | 2 | 5 | 2 | 10 | 2 | 5 | 2 | 5 | | 5 | 4 | 15 | 0 | 5 | 2 | 5 | 2 | 10 | 17 | 55 |
| Garbage (Non-Grindable) | Sanitation | 2 | 5 | 1 | 5 | 15 | 15 | 18 | 25 | | 5 | | 15 | | 20 | 1 | 5 | 5 | 5 | 0 | 15 | 6 | 25 | | 10 | | 15 | | 25 | 24 | 95 |
| | Safety | 1 | 5 | 1 | 5 | 5 | 5 | 7 | 15 | | 5 | | 5 | | 10 | 1 | 5 | 5 | 5 | 0 | 5 | 6 | 15 | | 5 | | 10 | | 15 | 13 | 55 |
| | Security | 2 | 5 | 0 | 5 | 5 | 5 | 7 | 15 | | 5 | | 5 | | 10 | 0 | 5 | 5 | 5 | 0 | 5 | 5 | 15 | | 5 | | 5 | | 10 | 12 | 50 |
| | Esthetics | 11 | 15 | 2 | 5 | 10 | 10 | 23 | 30 | | 5 | | 10 | | 15 | 2 | 5 | 10 | 10 | 0 | 5 | 12 | 20 | | 15 | | 20 | | 35 | 35 | 100 |
| Food Service Items | Sanitation | 2 | 5 | 2 | 5 | 10 | 10 | 14 | 20 | | 5 | | 10 | | 15 | | 5 | | 5 | | 15 | | 25 | 1 | 5 | 3 | 15 | 4 | 20 | 18 | 80 |
| | Safety | 5 | 10 | 0 | 10 | 5 | 10 | 10 | 30 | | 5 | | 10 | | 15 | | 5 | | 5 | | 10 | | 20 | 1 | 5 | 0 | 10 | 1 | 15 | 11 | 80 |
| | Security | 0 | 5 | 0 | 5 | 5 | 5 | 5 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | 0 | 5 | 0 | 5 | 0 | 10 | 5 | 50 |
| | Esthetics | 2 | 5 | 2 | 5 | 5 | 5 | 9 | 15 | | 5 | | 5 | | 10 | | 5 | | 5 | | 5 | | 15 | 2 | 5 | 0 | 5 | 2 | 10 | 11 | 50 |
| Total | Sanitation | 63 | 135 | 40 | 185 | 74 | 155 | 177 | 475 | | 210 | 42 | 165 | 42 | 375 | 35 | 135 | 27 | 85 | 5 | 165 | 67 | 385 | 15 | 90 | 151 | 350 | 166 | 440 | 452 | 1675 |
| | Safety | 35 | 115 | 24 | 135 | 42 | 85 | 101 | 335 | | 115 | 20 | 110 | 20 | 225 | 29 | 120 | 30 | 70 | 2 | 95 | 61 | 285 | 3 | 55 | 85 | 180 | 88 | 235 | 270 | 1080 |
| | Security | 11 | 80 | 0 | 40 | 57 | 125 | 68 | 245 | | 40 | 32 | 125 | 32 | 165 | 2 | 55 | 45 | 115 | 0 | 60 | 47 | 230 | 5 | 75 | 145 | 210 | 150 | 285 | 297 | 925 |
| | Esthetics | 46 | 85 | 22 | 60 | 49 | 65 | 117 | 210 | | 50 | 24 | 65 | 24 | 115 | 12 | 40 | 25 | 55 | 2 | 45 | 39 | 140 | 6 | 55 | 32 | 100 | 38 | 155 | 218 | 620 |
| TOTAL | | 155 | 415 | 86 | 420 | 222 | 430 | 463 | 1265 | | 415 | 118 | 465 | 118 | 880 | 78 | 350 | 127 | 325 | 9 | 365 | 214 | 1040 | 29 | 275 | 413 | 840 | 442 | 1115 | 1237 | 4300 |

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## MIRA LOMA DETENTION FACILITY

Due to the close relationship between the rehabilitation center and the Sheriff's facility, this report concerned with the characteristics of the solid waste system will cover both installations.

Total plant population, including inmates and paid employees, represents some 691 persons. From census records, this population consists of an average 533 inmates, 134 employees in the Sheriff's facility and 24 employees in the rehabilitation center.

Table VIII-7 illustrates probable variations in plant population that may occur over the weekly period, and relates the corresponding rate (percentage) of waste production by shifts that may be expected daily.

TABLE VIII-7 SHIFT POPULATION AND WASTE PRODUCTION

| | Monday - Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Inmates | 533 | 533 | 533 | 533 | 533 | 533 |
| Employees | 69 | 25 | 25 | 45 | 25 | 25 |
| Total Est. Population/Shift | 602 | 558 | 558 | 578 | 558 | 558 |
| Avg. Shift & Daily Pop. | | 573 | | | 565 | |
| Rate of Waste Production: % of Daily Production | 36% | 32% | 32% | 34% | 32% | 32% |

Although the above estimate and observations indicate that waste production is a continuing process, the major handling of accumulated wastes is primarily confined to services provided during the first shift operation.

Types of Waste Materials Generated:

Three basic categories of waste materials, soiled linen, garbage, and rubbish, were identified at the detention facility. Field observations were conducted during the latter months of 1968 to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes, (3) equipment and services provided for handling and disposal of these materials, and (4) methods and practices employed.

Handling of Waste Materials:

Observations of waste handling methods were generally limited to the inter-unit or inter-building systems. As may be expected, inmates are assigned on work details for the collection and movement of waste materials generally throughout the plant. Accumulations of bagged soiled linen are collected by hand cart from each building and transported to the receiving area of the on-site laundry. Garbage (non-grindable) from the kitchen and rubbish from all buildings are collected in barrels or cans, which are loaded on a Sheriff's Department flat-bed truck and moved to a central storage area. Contents of these containers are emptied into covered commercial bins. The commercial bins, furnished by a private refuse contractor, are serviced twice weekly by the contractor's packer truck. All materials are hauled to an area landfill for disposal.

Quantities and Types of Waste Materials:

Following the hospital waste survey at Mira Loma, a quantity survey of waste materials was also made at the detention facility. Portable scales were used on the truck route. After determining tare weights of containers, records of the daily collections were developed over a five-day period. During this period, typical daily activity involved the collection of 300 pounds of material from the rehabilitation center and 3,824 pounds of material from the Sheriff's facility. Collectively, all disposable wastes generated at the detention facility were calculated at 1,950 pounds daily, or equivalent to about 3.6 pounds per inmate, or 2.8 pounds per capita (based on average census of 533 inmates and gross population of 691). Soiled linens processed for the detention facility by the on-site laundry averaged 2,174 pounds per calendar day or 4.1 pounds per inmate. In summary, Table VIII-8 presents the types and quantities of wastes that may be expected to be generated daily at the detention facility.

TABLE VIII-8 SUMMARY OF DAILY WASTE PRODUCTION

| Type of Waste | Avg. Wt. Lbs./Day | % of Total | *Daily Production Factors | |
|---|---|---|---|---|
| | | | Lbs./Inmate | Lbs./Person |
| Soiled Linen | 2,174 | 52.6 | 4.1 | 3.1 |
| Rubbish | 810 | 19.6 | 1.5 | 1.2 |
| Garbage (Non-Grindable) | 1,140 | 27.8 | 2.1 | 1.6 |
| TOTAL WASTES | 4,124 | 100.0 | 7.7 | 5.9 |
| Total Disposable | 1,950 | 47.4 | 3.6 | 2.8 |
| Total Reusable | 2,174 | 52.6 | 4.1 | 3.1 |

*Based Avg. Census of 533 Inmates and Gross Population of 691

Note - Total Production Related to Gross Bldg. Area of 268,900 SF:
Disposables @ 7.2 Lbs./MSF, Reusables @ 8.1 Lbs./MSF
or Total of 15.3 Lbs./MSF Daily.

## Equipment, Personnel and Contract Services:

Limited County equipment and personnel are involved in the detention facility solid waste system. Principal collection of waste materials is nominally performed in a three to five hour period daily. Collection equipment is limited solely to the laundry carts and part-time use of the County truck. Storage equipment is limited to miscellaneous barrels and cans. Available labor (inmates) is utilized as required. It is estimated that an equivalent of three to four mandays are nominally required daily for the collection of reusable and disposable wastes in the inter-unit and inter-building collection, in addition to the inmates' time required for internal housekeeping.

Contract services provided by the private refuse contractor include furnishing of 13 3-cubic yard containers with pickup twice weekly. All disposable waste materials are hauled to area landfills for disposal. Costs of these services are at a rate of $351.00 monthly, or equivalent to about $12.00 daily.

Combined costs of equipment and contract services used in the waste system are estimated at about $50 daily. For purposes of this report, labor requirements of detention facility waste systems are not considered as significant cost factors.

## Evaluation of Existing System Operation:

A summary description of the separate solid waste systems employed at the detention facility is shown in Table VIII-9. This Table shows typical daily production of the various types of wastes and the prevailing methods of performing the various functions within the Inter-Unit or Inter-Building and Off-Site systems for each type of waste. It may be observed that on-site handling of wastes is largely done by manual methods.

The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials of movement and the conditions of storage facilities.

Table VIII-10 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in the latter months of 1968 and early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage facilities.

TABLE VIII-9 DESCRIPTION OF SOLID WASTE SYSTEM - MIRA LOMA REHABILITATION CENTER AND SHERIFF'S FACILITY

| System Components | Types of Waste | | |
|---|---|---|---|
| | Soiled Linen | Garbage | Rubbish |
| Inter-Unit or Inter-Building: | | | |
| Internal Transfer | Hand Cart | Sheriff's Truck | Sheriff's Truck |
| Central Storage | Laundry Sorting Area | Commercial Bins | Commercial Bins |
| Central Processing or Disposal | Laundry | --- | --- |
| Off-Site: | | | |
| External Transfer | --- | Private Packer Truck | Private Packer Truck |
| Final Processing and/or Disposal | --- | Private Landfill | Private Landfill |
| TOTAL WASTES PRODUCED | | | |
| Avg. Daily Weight | 2,174 | 1,140 | 810 |
| % of Total | 52.7 | 27.7 | 19.6 |

TABLE VIII-10 MIRA LOMA REHABILITATION CENTER AND SHERIFF'S FACILITY

## NUMERICAL RATING OF DETENTION FACILITY SOLID WASTE SYSTEMS

| System Components | | | Soiled Linen | | Garbage | | Rubbish | | Total | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| Inter-Unit or Inter-Building System | Internal Transfer | Sanitation | 5 | 25 | 2 | 5 | 5 | 20 | 12 | 50 | 51 | 160 |
| | | Safety | 2 | 10 | 3 | 15 | 11 | 15 | 16 | 40 | | |
| | | Security | 2 | 5 | 2 | 10 | 7 | 15 | 11 | 30 | | |
| | | Esthetics | 3 | 15 | 2 | 10 | 7 | 15 | 12 | 40 | | |
| | Central Storage | Sanitation | 5 | 10 | 3 | 5 | 2 | 5 | 10 | 20 | 130 | 195 |
| | | Safety | 2 | 10 | 3 | 5 | 19 | 25 | 24 | 40 | | |
| | | Security | 5 | 20 | 10 | 10 | 30 | 30 | 45 | 60 | | |
| | | Esthetics | 10 | 20 | 19 | 25 | 22 | 30 | 51 | 75 | | |
| | Central Processing or Disposal | Sanitation | 3 | 15 | | 20 | | 15 | 3 | 50 | 15 | 185 |
| | | Safety | 2 | 10 | | 20 | | 20 | 2 | 50 | | |
| | | Security | 3 | 15 | | 10 | | 15 | 3 | 40 | | |
| | | Esthetics | 7 | 15 | | 15 | | 15 | 7 | 45 | | |
| | Total | Sanitation | 13 | 50 | 5 | 30 | 7 | 40 | 25 | 120 | 196 | 540 |
| | | Safety | 6 | 30 | 6 | 40 | 30 | 60 | 42 | 130 | | |
| | | Security | 10 | 40 | 12 | 30 | 37 | 60 | 59 | 130 | | |
| | | Esthetics | 20 | 50 | 21 | 50 | 29 | 60 | 70 | 160 | | |
| Off-Site System | External Transfer | Sanitation | | 20 | 5 | 20 | 1 | 5 | 6 | 45 | 14 | 195 |
| | | Safety | | 15 | 0 | 15 | 0 | 20 | 0 | 50 | | |
| | | Security | | 15 | 0 | 15 | 0 | 15 | 0 | 45 | | |
| | | Esthetics | | 20 | 5 | 20 | 3 | 15 | 8 | 55 | | |
| | Final Processing and/or Disposal | Sanitation | | 30 | 5 | 30 | 3 | 15 | 8 | 75 | 106 | 265 |
| | | Safety | | 15 | 2 | 5 | 15 | 20 | 17 | 40 | | |
| | | Security | | 25 | 15 | 15 | 25 | 25 | 40 | 65 | | |
| | | Esthetics | | 30 | 22 | 30 | 19 | 25 | 41 | 85 | | |
| | Total | Sanitation | | 50 | 10 | 50 | 4 | 20 | 14 | 120 | 120 | 460 |
| | | Safety | | 30 | 2 | 20 | 15 | 40 | 17 | 90 | | |
| | | Security | | 40 | 15 | 30 | 25 | 40 | 40 | 110 | | |
| | | Esthetics | | 50 | 27 | 50 | 22 | 40 | 49 | 140 | | |
| TOTAL | | Sanitation | 13 | 100 | 15 | 80 | 11 | 60 | 39 | 240 | 316 | 1000 |
| | | Safety | 6 | 60 | 8 | 60 | 45 | 100 | 59 | 220 | | |
| | | Security | 10 | 80 | 27 | 60 | 62 | 100 | 99 | 240 | | |
| | | Esthetics | 20 | 100 | 48 | 100 | 51 | 100 | 119 | 300 | | |

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## CHAP. IX OTHER DETENTION FACILITIES

Page No.

DESCRIPTION OF DETENTION FACILITIES IX-1
  Types of Wastes Generated IX-1
  Common Characteristics of the Solid Waste Systems IX-2

CENTRAL JAIL IX-3
  Quantities and Types of Waste Materials IX-3
  Building, Equipment, Labor and Contract Services IX-7
  Evaluation of Existing System Operation IX-7

SYBIL BRAND INSTITUTE IX-9
  Quantities and Types of Waste Materials IX-9
  Building, Equipment, Labor and Contract Services IX-13
  Evaluation of Existing System Operation IX-13

SAN FERNANDO VALLEY JUVENILE HALL IX-15
  Quantities and Types of Waste Materials IX-15
  Building, Equipment, Labor and Other Services IX-19
  Evaluation of Existing System Operation IX-19

HALL OF JUSTICE IX-21
  Quantities and Types of Waste Materials IX-21
  Building, Equipment, Labor and Other Services IX-21
  Evaluation of Existing System Operation IX-24

Page No.

## LIST OF TABLES

IX-1 Characteristics of Institutions Under Study IX-1
IX-2 Description of Solid Waste System - Central Jail IX-6
IX-3 Numerical Rating of Solid Waste System - Central Jail IX-8
IX-4 Description of Solid Waste System - Sybil Brand Institute IX-12
IX-5 Numerical Rating of Solid Waste System - Sybil Brand Institute IX-14
IX-6 Description of Solid Waste System - San Fernando Valley Juvenile Hall IX-18
IX-7 Numerical Rating of Solid Waste System - San Fernando Valley Juvenile Hall IX-20
IX-8 Description of Solid Waste System - Hall of Justice IX-23
IX-9 Numerical Rating of Solid Waste System - Hall of Justice IX-25

## LIST OF FIGURES

IX-1 Site Plan of Central Jail IX-4
IX-2 Aerial View of Central Jail IX-5
IX-3 Site Plan of Sybil Brand Institute IX-10
IX-4 Aerial View of Sybil Brand Institute IX-11
IX-5 Site Plan of San Fernando Valley Juvenile Hall IX-16
IX-6 Aerial View of San Fernando Valley Juvenile Hall IX-17
IX-7 Aerial View of Hall of Justice IX-22

## DESCRIPTION OF DETENTION FACILITIES

Other Los Angeles County detention facilities investigated during the course of this study included the Central Jail, Sybil Brand Institute, San Fernando Juvenile Hall and the Hall of Justice.

Comparison of the basic characteristics of size and inmate capacity of these institutions are presented in Table IX-1. Although these institutions vary in function, and physical configuration, the characteristics of the solid waste systems of each were found to be quite similar.

TABLE IX-1 CHARACTERISTICS OF INSTITUTIONS UNDER STUDY

| | Central Jail | Sybil Brand Institute | San Fernando Juvenile Hall | Hall of Justice |
|---|---|---|---|---|
| Building Area (Sq. Ft.) | 750,000 | 230,340 | 208,700 | 539,000 |
| No. of Floors | 2 to 6 | 2 to 4 | 1 & 2 | 12 to 14 |
| Population: | | | | |
| Inmate Capacity | 3,000 | 836 | 515 | 2,900 |
| Total Employees | 500 | 166 | 233 | *217 |
| Gross Population | 3,500 | 1,002 | 748 | 3,117 |
| Type Inmate | Adult Male | Adult Female | Juvenile Male & Female | Adult Male & Female |

*Jail Personnel Only

Types of Wastes Generated:

Three basic categories of waste materials, soiled linen, garbage (non-grindable) and rubbish, were found in measurable amounts in the mainstream of the solid waste system in these detention facilities. Other categories of solid wastes were also found. However, these materials, such as food preparation wastes generally disposed of by kitchen grinders, and trace amounts of contaminated wastes from infirmaries disposed of by incineration in the larger institutions, were not considered as significant factors in the overall system.

Common Characteristics of the Solid Waste Systems:

Field observations were conducted during early 1969 to determine (1) daily quantities of solid wastes produced, (2) distribution of generated wastes, (3) equipment and services provided for handling and disposal of these waste materials, and (4) methods and practices employed. Observations of waste handling methods were generally limited to the inter-unit or inter-building systems. With few exceptions, systems were the same at each of the institutions. In the case of soiled linen, hand cart collection of bagged linen prevails. Interim storage is provided in a central storage area in those facilities where off-site processing is required. Containerized garbage is stored on or adjacent to loading docks to await daily collection. This material is disposed of by hog feeding. Rubbish is generally collected by hand cart and deposited in commercial bins provided by private refuse contractors. These bins are serviced daily by the contractor's packer truck and waste materials are delivered to area landfills for ultimate disposal. As may be expected, inmates are assigned on work details for the collection and movement of waste materials generally throughout the plant. For purposes of this report, internal labor requirements of detention facility waste systems are not considered as significant cost factors and analysis of time and manpower is not considered meaningful. In all cases, adequate inmate manpower is available for such housekeeping services. This is one of the principal functions which keeps them occupied.

The following sections of this chapter will present pertinent data on each of these institutions, including quantities and types of wastes generated daily, description of the system and evaluation of the system operation.

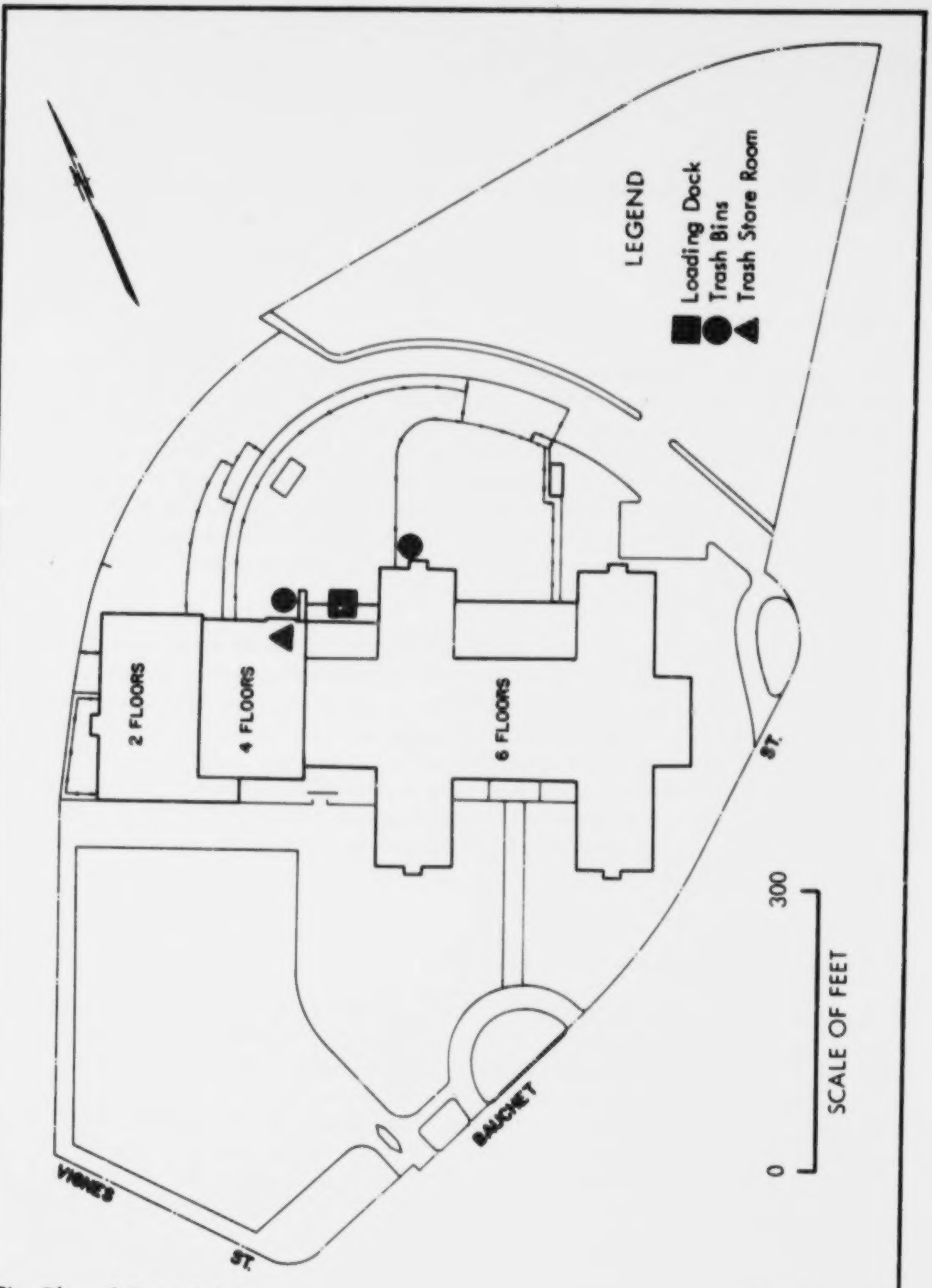
## CENTRAL JAIL

The Central Jail is situated approximately one mile northeast of the downtown Los Angeles Civic Center Complex. Figure IX-1, the site plan, shows the plant orientation on a parcel of approximately 15 acres. Figure IX-2, an aerial view of this detention facility, further illustrates the configuration of the plant. The upper four levels of the six-floor building area house self-contained security sections. The first floor (ground floor) of this building area is generally limited to administrative and processing functions. Three levels of the four-story building area contain infirmary facilities for the plant. The partial basement provides space for dietary, housekeeping and building maintenance and services.

A central longitudinal corridor at all levels interconnected by elevators provides the basic route for movement of supplies and solid waste materials. A central loading dock on the ground floor handles all incoming supplies, which are immediately routed to the basement level via freight elevator for processing, storing and/or distribution. All solid wastes follow this same route in reverse. Collected waste materials on hand carts are delivered to the loading dock for central storage. Storage facilities and accessories for the waste system include 10 commercial bins, a trash storage room, a refrigerated garbage storage room and a can washing room, all adjacent to the loading dock.

### Quantities and Types of Waste Materials:

The quantity survey of solid waste materials was made over a five day period using portable scales at the loading dock station. During this period, typical daily activity involved the collection of about 11,620 pounds of disposable wastes, equivalent to a production of about 3.9 pounds per inmate or 3.3 pounds per capita. Typical production of soiled linen amounted to 12,000 pounds daily, equivalent to about 4 pounds per inmate or 3.4 pounds per capita. Table IX-2 provides a description of the methods and practices involved in the handling of the principal solid wastes at Central Jail, together with daily quantities of each material.


LEGEND
■ Loading Dock
● Trash Bins
▲ Trash Store Room
2 FLOORS
4 FLOORS
6 FLOORS
VIGNES ST.
BAUCHET ST.
0
300
SCALE OF FEET

Site Plan of Central Jail

FIGURE IX-1

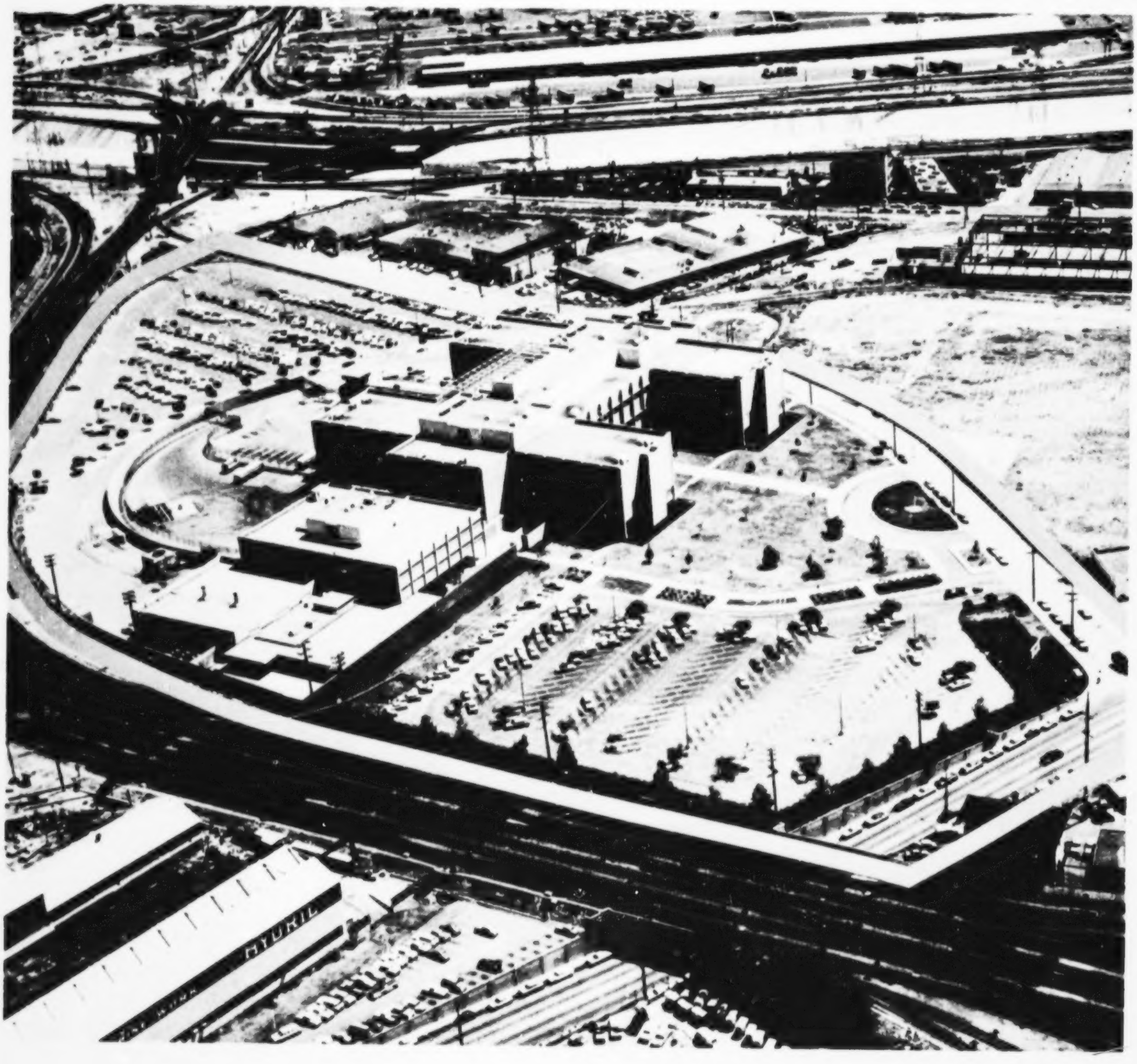


FIGURE IX-2 AERIAL VIEW OF CENTRAL JAIL

## TABLE IX-2 DESCRIPTION OF SOLID WASTE SYSTEM - CENTRAL JAIL

| System Components | Types of Waste | | |
|---|---|---|---|
| | Soiled Linen | Garbage | Rubbish |
| Inter-Unit or Inter-Building: | | | |
| Internal Transfer | Hand Cart | Hand Cart | Hand Cart |
| Central Storage | Soiled Linen Room | Refrigerated Storage Room | Commercial Bins |
| Central Processing or Disposal | --- | --- | --- |
| Off-Site: | | | |
| External Transfer | Sheriff's Truck | Private Truck | Private Packer Truck |
| Final Processing and/or Disposal | Mira Loma Laundry | Hog Feeding | Private Landfill |
| TOTAL WASTES PRODUCED | | | |
| Avg. Daily Weight | 12,000 | 7,420 | 4,200 |
| % of Total | 50.8 | 31.5 | 17.7 |

Building, Equipment, Labor and Contract Services:

Limited building areas (about 400 square feet) are provided in the vicinity of the loading dock for the exclusive use of the waste system. Collection equipment is limited solely to hand carts and part-time use of the County truck for transport of soiled linen to the Mira Loma Laundry. Storage equipment is limited to miscellaneous barrels and cans. Available labor (inmates) is utilized as required for the daily collection of reusable and disposable wastes in the inter-unit and inter-building collection, in addition to the inmates' time required for internal housekeeping.

Contract services provided by the private refuse contractor include furnishing of 10 4-cubic yard containers with pickup daily. All disposable waste materials are hauled to area landfills for disposal. Costs of these services are at a rate of $342.00 monthly, or equivalent to about $11.00 daily.

Combined costs of building, equipment and contract services used in the waste system are estimated at less than $100 daily. For purposes of this report, labor requirements of detention facility waste systems are not considered as significant cost factors.

Evaluation of Existing System Operation:

The summary description of the separate solid waste systems presented previously indicates that on-site handling of wastes is largely done by manual methods. The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

Table IX-3 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage and off-site disposal facilities.

TABLE IX-3 NUMERICAL RATING OF SOLID WASTE SYSTEM - CENTRAL JAIL

| | System Components | | Soiled Linen | | Garbage | | Rubbish | | Total | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| Inter-Unit or Inter-Building System | Internal Transfer | Sanitation | 13 | 25 | 2 | 5 | 5 | 20 | 20 | 50 | 46 | 160 |
| | | Safety | 5 | 10 | 3 | 15 | 3 | 15 | 11 | 40 | | |
| | | Security | 2 | 5 | 2 | 10 | 3 | 15 | 7 | 30 | | |
| | | Esthetics | 3 | 15 | 2 | 10 | 3 | 15 | 8 | 40 | | |
| | Central Storage | Sanitation | 2 | 10 | 2 | 5 | 1 | 5 | 5 | 20 | 61 | 195 |
| | | Safety | 0 | 10 | 1 | 5 | 5 | 25 | 6 | 40 | | |
| | | Security | 5 | 20 | 5 | 10 | 15 | 30 | 25 | 60 | | |
| | | Esthetics | 5 | 20 | 5 | 25 | 15 | 30 | 25 | 75 | | |
| | Central Processing or Disposal | Sanitation | | 15 | | 20 | | 15 | | 50 | | 185 |
| | | Safety | | 10 | | 20 | | 20 | | 50 | | |
| | | Security | | 15 | | 10 | | 15 | | 40 | | |
| | | Esthetics | | 15 | | 15 | | 15 | | 45 | | |
| | Total | Sanitation | 15 | 50 | 4 | 30 | 6 | 40 | 25 | 120 | 107 | 540 |
| | | Safety | 5 | 30 | 4 | 40 | 8 | 60 | 17 | 130 | | |
| | | Security | 7 | 40 | 7 | 10 | 18 | 60 | 32 | 130 | | |
| | | Esthetics | 8 | 50 | 7 | 50 | 18 | 60 | 33 | 160 | | |
| Off-Site System | External Transfer | Sanitation | 5 | 20 | 5 | 20 | 1 | 5 | 11 | 45 | 41 | [illegible] |
| | | Safety | 3 | 15 | 3 | 15 | 5 | 20 | 11 | 50 | | |
| | | Security | 3 | 15 | 3 | 15 | 0 | 15 | 6 | 45 | | |
| | | Esthetics | 5 | 20 | 5 | 20 | 3 | 15 | 13 | 55 | | |
| | Final Processing and/or Disposal | Sanitation | 15 | 30 | 5 | 30 | 3 | 15 | 23 | 75 | 124 | 265 |
| | | Safety | 3 | 15 | 1 | 5 | 15 | 20 | 19 | 40 | | |
| | | Security | 5 | 25 | 3 | 15 | 25 | 25 | 33 | 65 | | |
| | | Esthetics | 15 | 30 | 15 | 30 | 19 | 25 | 49 | 85 | | |
| | Total | Sanitation | 20 | 50 | 10 | 50 | 4 | 20 | 34 | 120 | 165 | 460 |
| | | Safety | 6 | 30 | 4 | 20 | 20 | 40 | 30 | 90 | | |
| | | Security | 8 | 40 | 6 | 30 | 25 | 40 | 39 | 110 | | |
| | | Esthetics | 20 | 50 | 20 | 50 | 22 | 40 | 62 | 140 | | |
| | TOTAL | Sanitation | 35 | 100 | 14 | 80 | 10 | 60 | 59 | 240 | 272 | 1000 |
| | | Safety | 11 | 60 | 8 | 60 | 28 | 100 | 47 | 220 | | |
| | | Security | 15 | 80 | 13 | 60 | 43 | 100 | 71 | 240 | | |
| | | Esthetics | 28 | 100 | 27 | 100 | 40 | 100 | 95 | 300 | | |

## SYBIL BRAND INSTITUTE

Sybil Brand Institute is situated approximately four miles east of the downtown Los Angeles Civic Center Complex. Figure IX-3, the site plan, shows the identification and orientation of buildings located on a developed parcel of some eight acres. Figure IX-4, an aerial view of this detention facility, further illustrates the relationship of buildings at this institution. The Administration Building and Detention Unit, the principal buildings, are connected by a ramp system, corridors, stairs and elevators.

The Administration Building contains maintenance shops, laundry, storage and loading dock on the first floor level, together with administrative and processing functions. The second level houses the main kitchen, mess halls and sewing department. The infirmary is located on the third level of this building.

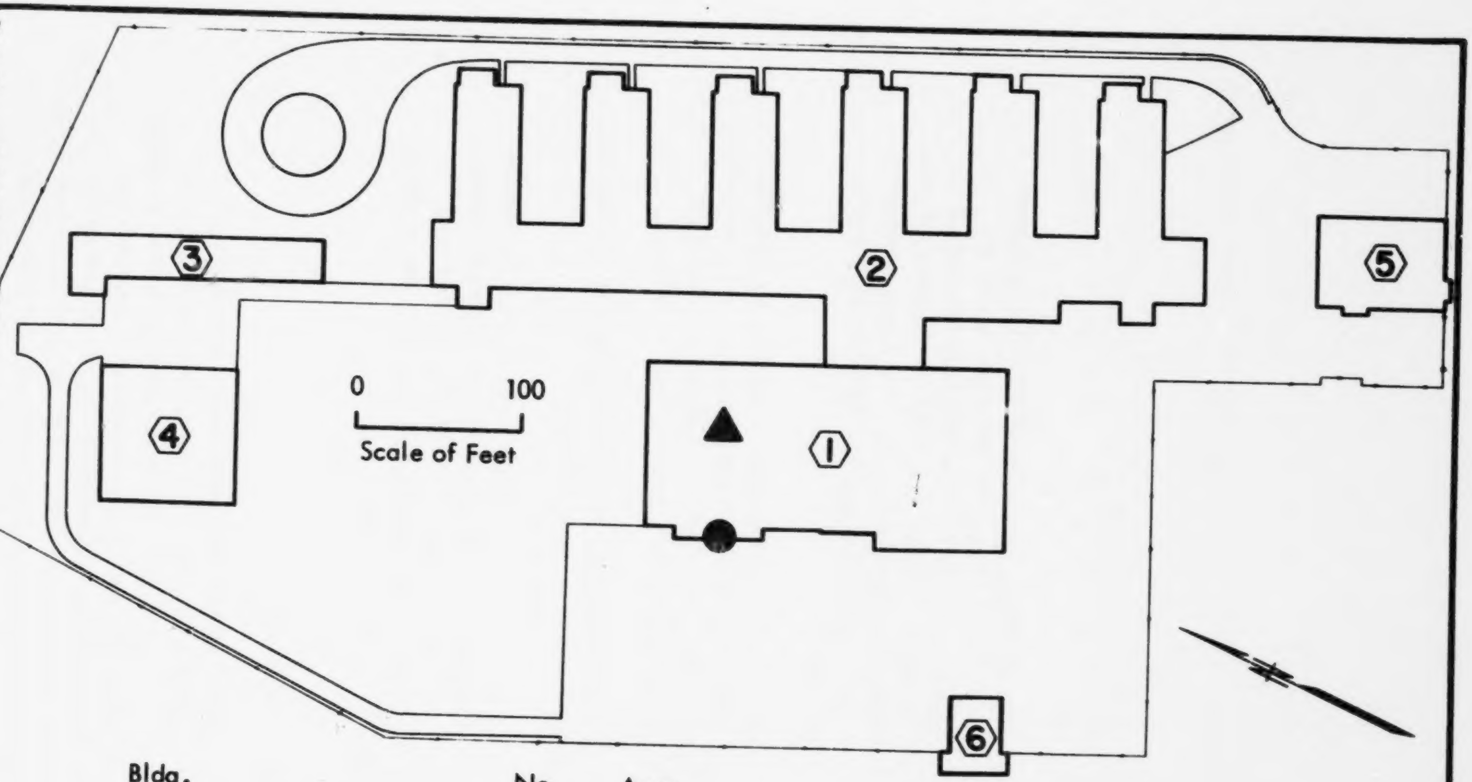
All three levels of the multiwing Detention Unit Building are devoted exclusively to cell blocks, inmate dormitories and accessory facilities.

Mixed refuse or rubbish and garbage is collected in forty gallon cans by inmate work details. An assigned crew transports these cans by hand cart to the loading dock area in the Administration Building, where contents are emptied into commercial storage bins. A refrigerated garbage storage room and can washing room are also located adjacent to the loading dock.

### Quantities and Types of Waste Materials:

The quantity survey of solid waste materials was made over a five day period using portable scales at the loading dock station. During this period, typical daily activity involved the collection of about 2,584 pounds of disposable wastes, equivalent to a production of about 3.1 pounds per inmate or 1.6 pounds per capita. Typical production of soiled linen amounted to 1,756 pounds daily, equivalent to about 2.1 pounds per inmate or 1.8 pounds per capita. Table IX-4 provides a description of the methods and practices involved in the handling of the principal solid wastes at Sybil Brand Institute, together with daily quantities of each material.

Site Plan of Sybil Brand Institute



| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Administration | 3 | 59,400 |
| 2 | Detention Unit | 3 | 149,400 |
| 3 | Activity Unit | 1 | 4,260 |
| 4 | Auditorium | 1 | 8,900 |
| 5 | Boiler House | 1 | 6,100 |
| 6 | Gate House | 1 | 2,200 |

LEGEND

⬡ Building Number
● Loading Dock
▲ Soiled Linen Storage

FIGURE IX-3

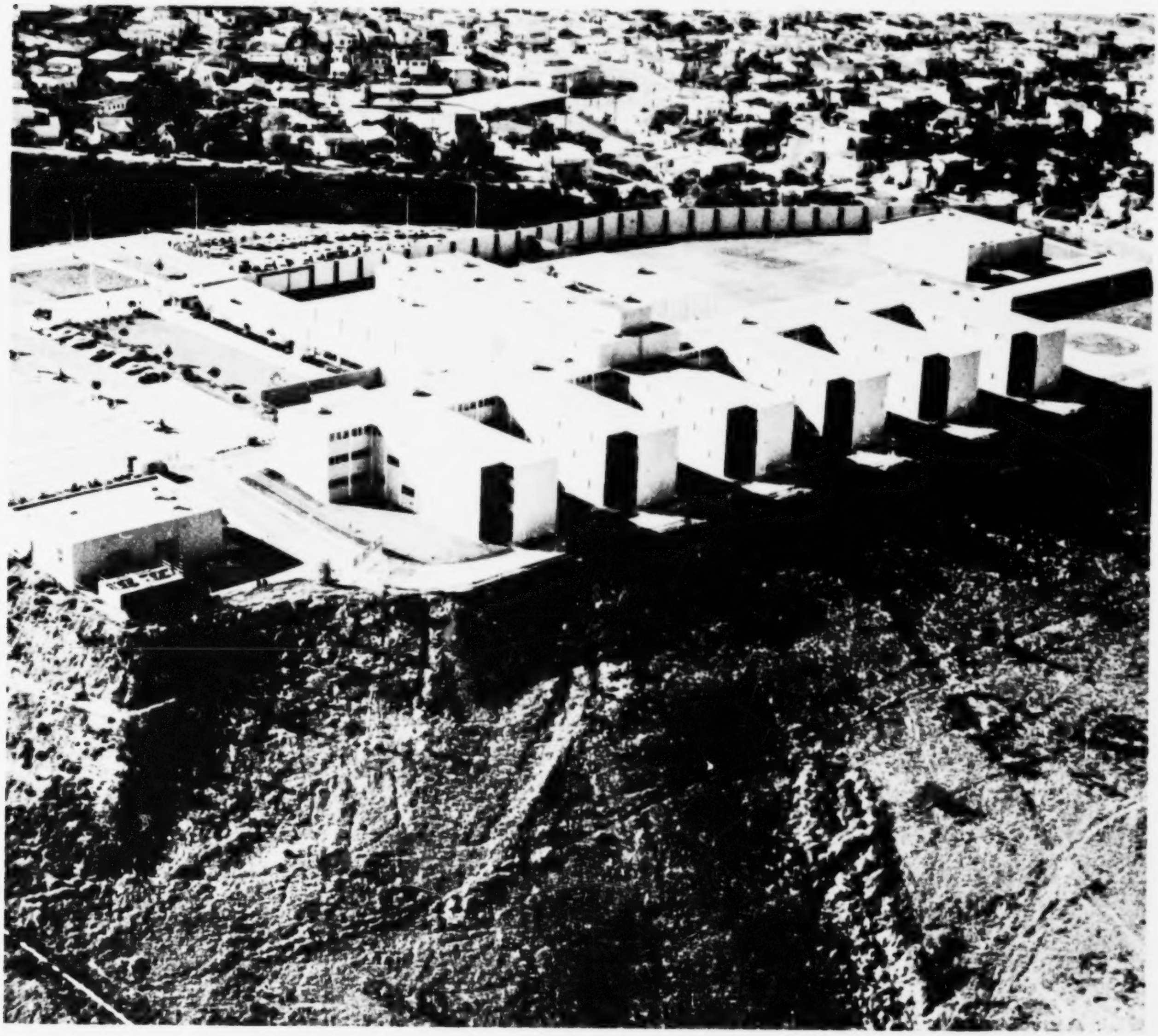


FIGURE IX-4 AERIAL VIEW OF SYBIL BRAND INSTITUTE

TABLE IX-4 DESCRIPTION OF SOLID WASTE SYSTEM - SYBIL BRAND INSTITUTE

| System Components | Types of Waste | | |
|---|---|---|---|
| | Soiled Linen | Garbage | Rubbish |
| Inter-Unit or Inter-Building: | | | |
| Internal Transfer | Hand Cart | Hand Cart | Hand Cart |
| Central Storage | Laundry Sorting Area | Commercial Bins | Commercial Bins |
| Central Processing or Disposal | Laundry | --- | --- |
| Off-Site: | | | |
| External Transfer | --- | Private Truck | Private Packer Truck |
| Final Processing and/or Disposal | --- | Hog Feeding | Private Landfill |
| TOTAL WASTES PRODUCED | | | |
| Avg. Daily Weight | 1,756 | 1,367 | 1,217 |
| % of Total | 40.5 | 31.5 | 28.0 |

Building, Equipment, Labor and Contract Services:

Limited building areas (about 100 square feet) are provided in the vicinity of the loading dock for the exclusive use of the waste system. Collection equipment is limited solely to hand carts for the internal transport of rubbish, garbage and soiled linen. Storage equipment is generally limited to the forty gallon cans. Available labor (women inmates) is utilized as required for the daily collection of reusable and disposable wastes in the inter-unit and inter-building collection, in addition to the inmates' time required for internal housekeeping.

Contract services provided by the private refuse contractor include furnishing of 5 3-cubic yard containers with pickup daily. All disposable waste materials other than garbage are hauled to area landfills for disposal. Costs of these services are at a rate of $150.00 monthly, or equivalent to about $5.00 daily.

Combined costs of building, equipment and contract services used in the waste system are estimated at less than $50 daily. For purposes of this report, labor requirements of detention facility waste systems are not considered as significant cost factors.

Evaluation of Existing System Operation:

The summary description of the separate solid waste systems presented previously indicates that on-site handling of wastes is largely done by manual methods. The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

Table IX-5 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage and off-site disposal facilities.

TABLE IX-5 NUMERICAL RATING OF SOLID WASTE SYSTEM - SYBIL BRAND INSTITUTE

| System Components | | | Soiled Linen | | Garbage | | Rubbish | | Total | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| Inter-Unit or Inter-Building System | Internal Transfer | Sanitation | 5 | 25 | 2 | 5 | 5 | 20 | 12 | 50 | 39 | 160 |
| | | Safety | 2 | 10 | 3 | 15 | 3 | 15 | 8 | 40 | | |
| | | Security | 2 | 5 | 2 | 10 | 7 | 15 | 11 | 30 | | |
| | | Esthetics | 3 | 15 | 2 | 10 | 3 | 15 | 8 | 40 | | |
| | Central Storage | Sanitation | 2 | 10 | 2 | 5 | 2 | 5 | 6 | 20 | 85 | 195 |
| | | Safety | 2 | 10 | 1 | 5 | 13 | 25 | 16 | 40 | | |
| | | Security | 5 | 20 | 5 | 10 | 15 | 30 | 25 | 60 | | |
| | | Esthetics | 10 | 20 | 13 | 25 | 15 | 30 | 38 | 75 | | |
| | Central Processing or Disposal | Sanitation | 3 | 15 | | 20 | | 15 | 3 | 50 | 15 | 185 |
| | | Safety | 2 | 10 | | 20 | | 20 | 2 | 50 | | |
| | | Security | 7 | 15 | | 10 | | 15 | 7 | 40 | | |
| | | Esthetics | 3 | 15 | | 15 | | 15 | 3 | 45 | | |
| | Total | Sanitation | 10 | 50 | 4 | 30 | 7 | 40 | 21 | 120 | 139 | 540 |
| | | Safety | 6 | 30 | 4 | 40 | 16 | 60 | 26 | 130 | | |
| | | Security | 14 | 40 | 7 | 30 | 22 | 60 | 43 | 130 | | |
| | | Esthetics | 16 | 50 | 15 | 50 | 18 | 60 | 49 | 160 | | |
| Off-Site System | External Transfer | Sanitation | | 20 | 5 | 20 | 1 | 5 | 6 | 45 | 17 | 195 |
| | | Safety | | 15 | 3 | 15 | 0 | 20 | 3 | 50 | | |
| | | Security | | 15 | 0 | 15 | 0 | 15 | 0 | 45 | | |
| | | Esthetics | | 20 | 5 | 20 | 3 | 15 | 8 | 55 | | |
| | Final Processing and/or Disposal | Sanitation | | 30 | 5 | 30 | 3 | 15 | 8 | 75 | 86 | 265 |
| | | Safety | | 15 | 1 | 5 | 15 | 20 | 16 | 40 | | |
| | | Security | | 25 | 3 | 15 | 25 | 25 | 28 | 65 | | |
| | | Esthetics | | 30 | 15 | 30 | 19 | 25 | 34 | 85 | | |
| | Total | Sanitation | | 50 | 10 | 50 | 4 | 20 | 14 | 120 | 103 | 460 |
| | | Safety | | 30 | 4 | 20 | 15 | 40 | 19 | 90 | | |
| | | Security | | 40 | 3 | 30 | 25 | 40 | 28 | 110 | | |
| | | Esthetics | | 50 | 20 | 50 | 22 | 40 | 42 | 140 | | |
| | TOTAL | Sanitation | 10 | 100 | 14 | 80 | 11 | 60 | 35 | 240 | 242 | 1000 |
| | | Safety | 6 | 60 | 8 | 60 | 31 | 100 | 45 | 220 | | |
| | | Security | 14 | 80 | 10 | 60 | 47 | 100 | 71 | 240 | | |
| | | Esthetics | 16 | 100 | 35 | 100 | 40 | 100 | 91 | 300 | | |

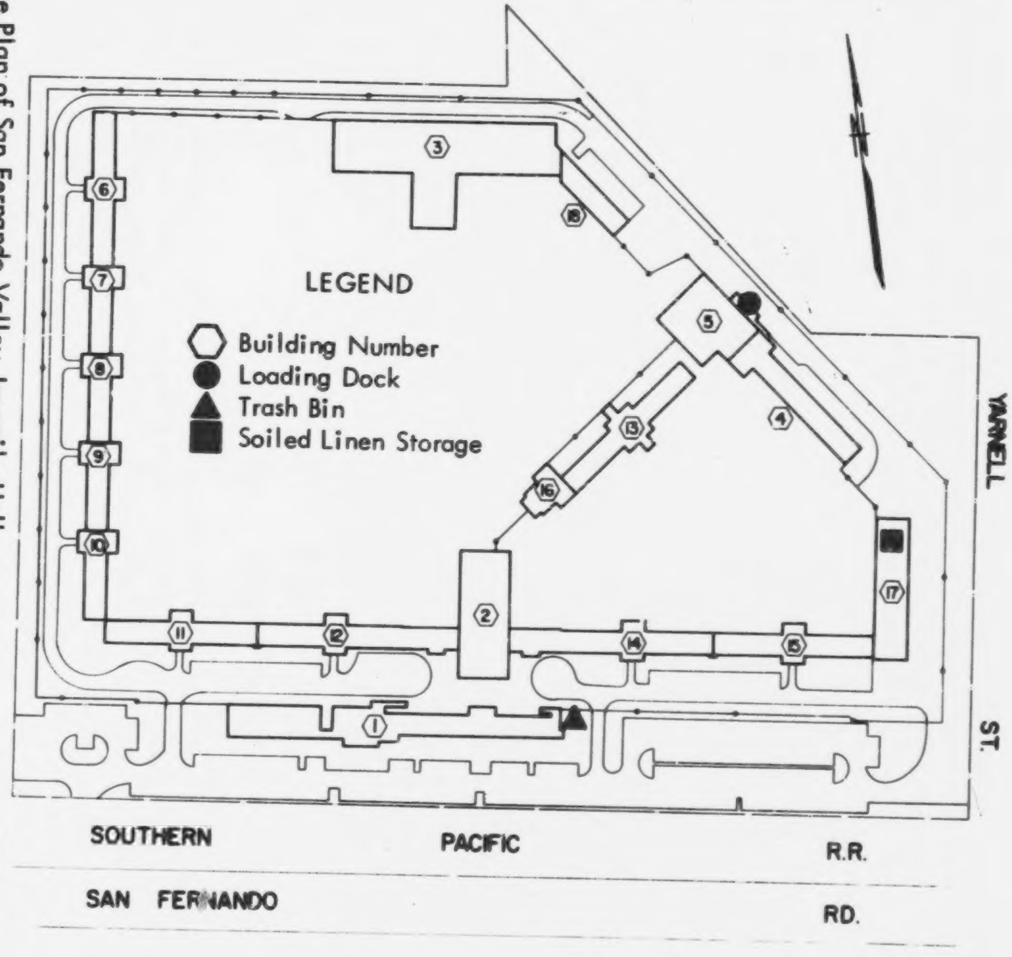
## SAN FERNANDO VALLEY JUVENILE HALL

San Fernando Valley Juvenile Hall is located about 25 miles northwest of the downtown Los Angeles Civic Center. This relatively new complex of 18 one and two-story buildings has been developed on a parcel of about 30 acres near the foothills of the San Gabriel mountains. Figure IX-5, the site plan, and Figure IX-6, an aerial view of this institution, show the arrangement and characteristics of buildings at this institution.

Containerized rubbish and bagged soiled linens are stored in locked utility rooms in each of the dormitory living units. Soiled linen is collected by hand cart and transported to central linen storage in Building 17 to await transport to nearby Olive View Hospital laundry for processing and return. Rubbish is also collected by hand cart and transported to an open central storage area on the main loading dock at Building 5 (the main kitchen). The majority of refuse materials are bagged. However, minor quantities of loose and wet wastes present problems in area sanitation. Rubbish is retained on the loading dock for collection by the Olive View Hospital packer truck, which is scheduled daily for this service. A garbage storage room and can washing area are adjacent to the loading dock area. Garbage production from the main kitchen is segregated and held for daily truck collection by the County Hog Farm. Minor quantities of suet, bones and grease are retained in refrigerated storage for later sale to local renderers. Supplementary rubbish storage is provided by a 2-cubic yard covered bin adjacent to the Administration Building and outside of the security area.

### Quantities and Types of Waste Materials:

The quantity survey of solid waste materials was made over a four day period using portable scales at the loading dock station. During this period, typical daily activity involved the collection of about 2,660 pounds of disposable wastes, equivalent to a production of about 5.1 pounds per inmate or 3.5 pounds per capita. Typical production of soiled linen amounted to 895 pounds daily, equivalent to about 1.7 pounds per inmate or 1.2 pounds per capita. Table IX-6 provides a description of the methods and practices involved in the handling of


LEGEND
Building Number
Loading Dock
Trash Bin
Soiled Linen Storage
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
YARNELL
ST.
SOUTHERN
PACIFIC
R.R.
SAN FERNANDO
RD.

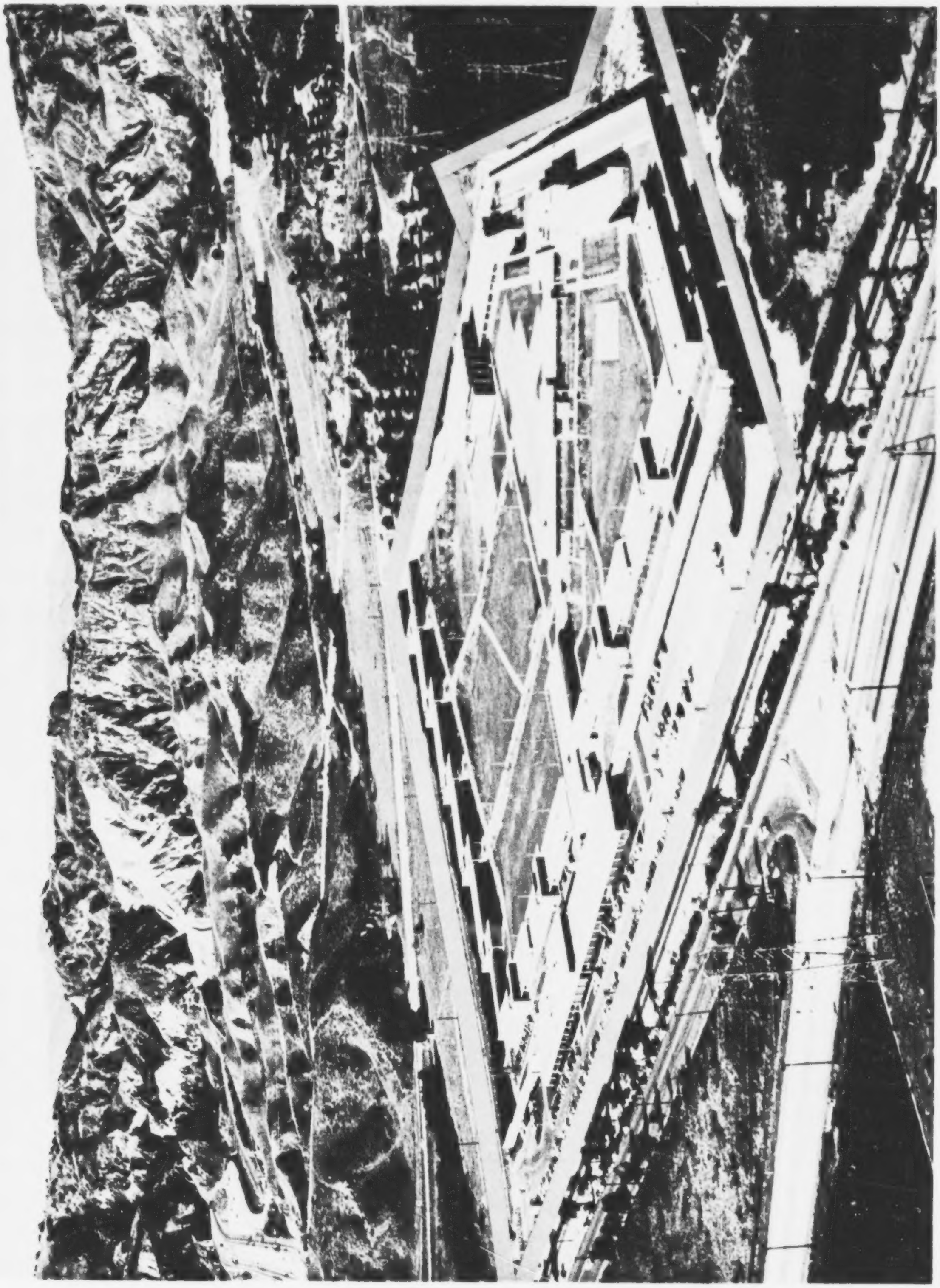
BUILDING SCHEDULE

| Bldg. No. | Function | No. Floors | Area (SF) |
|---|---|---|---|
| 1 | Administration | 2 | 24,720 |
| 2 | Infirmary | 2 | 26,718 |
| 3 | Boys School & Gym | 1 | 30,200 |
| 4 | Girls School & Gym | 1 | 8,300 |
| 5 | Kitchen & Dining | 1 | 10,300 |
| 6 | Living Unit | 2 | 11,050 |
| 7 | Living Unit | 2 | 10,000 |
| 8 | Living Unit | 2 | 10,000 |
| 9 | Living Unit | 2 | 10,000 |
| 10 | Living Unit | 1 | 5,000 |
| 11 | Living Unit | 1 | 8,000 |
| 12 | Living Unit | 1 | 10,200 |
| 13 | Living Unit | 1 | 9,100 |
| 14 | Living Unit | 1 | 10,450 |
| 15 | Living Unit | 1 | 8,000 |
| 16 | Chapel | 1 | 3,200 |
| 17 | Maintenance | 1 | 9,550 |
| 18 | Mechanical | 1 | 3,910 |

0 500
SCALE OF FEET

Site Plan of San Fernando Valley Juvenile Hall

FIGURE IX-5



Aerial View of San Fernando Valley Juvenile Hall

FIGURE IX-6

TABLE IX-6 DESCRIPTION OF SOLID WASTE SYSTEM - SAN FERNANDO VALLEY JUVENILE HALL

| System Components | Types of Waste | | |
|---|---|---|---|
| | Soiled Linen | Garbage | Rubbish |
| Inter-Unit or Inter-Building: | | | |
| Internal Transfer | Hand Cart | Hand Cart | Hand Cart |
| Central Storage | Soiled Linen Room | Area Near Loading Dock | Loading Dock |
| Central Processing or Disposal | --- | --- | --- |
| Off-Site: | | | |
| External Transfer | Institution Truck | Sheriff's Truck | Institution Truck |
| Final Processing and/or Disposal | Olive View Laundry | Hog Feeding | Private Landfill |
| TOTAL WASTES PRODUCED | | | |
| Avg. Daily Weight | 895 | 1,300 | 1,360 |
| % of Total | 25.2 | 36.5 | 38.3 |

the principal solid wastes at San Fernando Valley Juvenile Hall, together with daily quantities of each material.

## Building, Equipment, Labor and Other Services:

Limited building areas (about 300 square feet) are provided for the exclusive use of the waste system, excluding the multi-purpose utility rooms used for initial storage of waste materials. Collection equipment is limited solely to hand carts for transport. Storage equipment is limited to miscellaneous bins and cans. Available labor (juveniles) are assigned on housekeeping tasks as required, including the daily collection of wastes throughout the plant.

The waste system of San Fernando Valley Juvenile Hall is assisted by the services of Olive View Hospital in collection and processing of soiled linen as well as hauling and disposal of rubbish in area landfills.

Combined costs of building, equipment and contract services used in the waste system are estimated at less than $75 daily. For purposes of this report, labor requirements of detention facility waste systems are not considered as significant cost factors.

## Evaluation of Existing System Operation:

The summary description of the separate solid waste systems presented previously indicates that on-site handling of wastes is largely done by manual methods. The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

Table IX-7 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage and off-site disposal facilities.

TABLE IX-7 NUMERICAL RATING OF SOLID WASTE SYSTEM - SAN FERNANDO VALLEY JUVENILE HALL

| System Components | | | Soiled Linen | | Garbage | | Rubbish | | Total | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| Inter-Unit or Inter-Building System | Internal Transfer | Sanitation | 5 | 25 | 2 | 5 | 5 | 20 | 12 | 50 | 35 | 160 |
| | | Safety | 2 | 10 | 3 | 15 | 3 | 15 | 8 | 40 | | |
| | | Security | 2 | 5 | 2 | 10 | 3 | 15 | 7 | 30 | | |
| | | Esthetics | 3 | 15 | 2 | 10 | 3 | 15 | 8 | 40 | | |
| | Central Storage | Sanitation | 2 | 10 | 2 | 5 | 2 | 5 | 6 | 20 | 96 | 195 |
| | | Safety | 2 | 10 | 2 | 5 | 13 | 25 | 17 | 40 | | |
| | | Security | 5 | 20 | 5 | 10 | 15 | 30 | 25 | 60 | | |
| | | Esthetics | 5 | 20 | 13 | 25 | 30 | 30 | 48 | 75 | | |
| | Central Processing or Disposal | Sanitation | | 15 | | 20 | | 15 | | 50 | | 185 |
| | | Safety | | 10 | | 20 | | 20 | | 50 | | |
| | | Security | | 15 | | 10 | | 15 | | 40 | | |
| | | Esthetics | | 15 | | 15 | | 15 | | 45 | | |
| | Total | Sanitation | 7 | 50 | 4 | 30 | 7 | 40 | 18 | 120 | 131 | 540 |
| | | Safety | 4 | 30 | 5 | 40 | 16 | 60 | 25 | 130 | | |
| | | Security | 7 | 40 | 7 | 30 | 18 | 60 | 32 | 130 | | |
| | | Esthetics | 8 | 50 | 15 | 50 | 33 | 60 | 56 | 160 | | |
| Off-Site System | External Transfer | Sanitation | 5 | 20 | 5 | 20 | 2 | 5 | 12 | 45 | 46 | 195 |
| | | Safety | 3 | 15 | 3 | 15 | 5 | 20 | 11 | 50 | | |
| | | Security | 3 | 15 | 3 | 15 | 0 | 15 | 6 | 45 | | |
| | | Esthetics | 5 | 20 | 5 | 20 | 7 | 15 | 17 | 55 | | |
| | Final Processing and/or Disposal | Sanitation | 15 | 30 | 5 | 30 | 3 | 15 | 23 | 75 | 124 | 265 |
| | | Safety | 3 | 15 | 1 | 5 | 15 | 20 | 19 | 40 | | |
| | | Security | 5 | 25 | 3 | 15 | 25 | 25 | 33 | 65 | | |
| | | Esthetics | 15 | 30 | 15 | 30 | 19 | 25 | 49 | 85 | | |
| | Total | Sanitation | 20 | 50 | 10 | 50 | 5 | 20 | 35 | 120 | 170 | 460 |
| | | Safety | 6 | 30 | 4 | 20 | 20 | 40 | 30 | 90 | | |
| | | Security | 8 | 40 | 6 | 30 | 25 | 40 | 39 | 110 | | |
| | | Esthetics | 20 | 50 | 20 | 50 | 26 | 40 | 66 | 140 | | |
| TOTAL | | Sanitation | 27 | 100 | 14 | 80 | 12 | 60 | 53 | 240 | 301 | 1000 |
| | | Safety | 10 | 60 | 9 | 60 | 36 | 100 | 55 | 220 | | |
| | | Security | 15 | 80 | 13 | 60 | 43 | 100 | 71 | 240 | | |
| | | Esthetics | 28 | 100 | 35 | 100 | 59 | 100 | 122 | 300 | | |

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## HALL OF JUSTICE

The Hall of Justice is located at Temple Street and Broadway in the downtown Los Angeles Civic Center Complex. Figures X-1 presented in Chapter X illustrates the characteristics of this Complex and the location of this building. Figure IX-7, an aerial view, illustrates basic configuration of this institution.

This building houses a number of County offices, including the District Attorney, Public Defender, Coroner-Chief Medical Examiner, Grand Jury, Municipal Courts and Criminal Divisions of the County Clerk in addition to the Sheriff's headquarters and Hall of Justice Jail.

The waste collection system is divided in this institution. Inmate work details handle internal collections in the jail areas. The County Department of Building Services provides collection services to other areas, transporting the materials by hand cart and freight elevator to central storage areas on the ground floor level. Storage facilities for the waste system include 12 commercial bins for rubbish, storage rooms for garbage and soiled linen.

### Quantities and Types of Waste Materials:

The quantity survey of solid waste materials was made over a four day period using portable scales at the loading dock station. During this period, typical daily activity involved the collection of about 7,036 pounds of disposable wastes, equivalent to a production of about 2.4 pounds per inmate or 2.3 pounds per capita. Typical production of soiled linen amounted to 7,000 pounds daily, equivalent to about 2.4 pounds per inmate or 2.2 pounds per capita. Table IX-8 provides a description of the methods and practices involved in the handling of the principal solid wastes at the Hall of Justice, together with daily quantities of each material.

### Building, Equipment, Labor and Other Services:

Limited building areas (about 300 square feet) are provided for the exclusive use

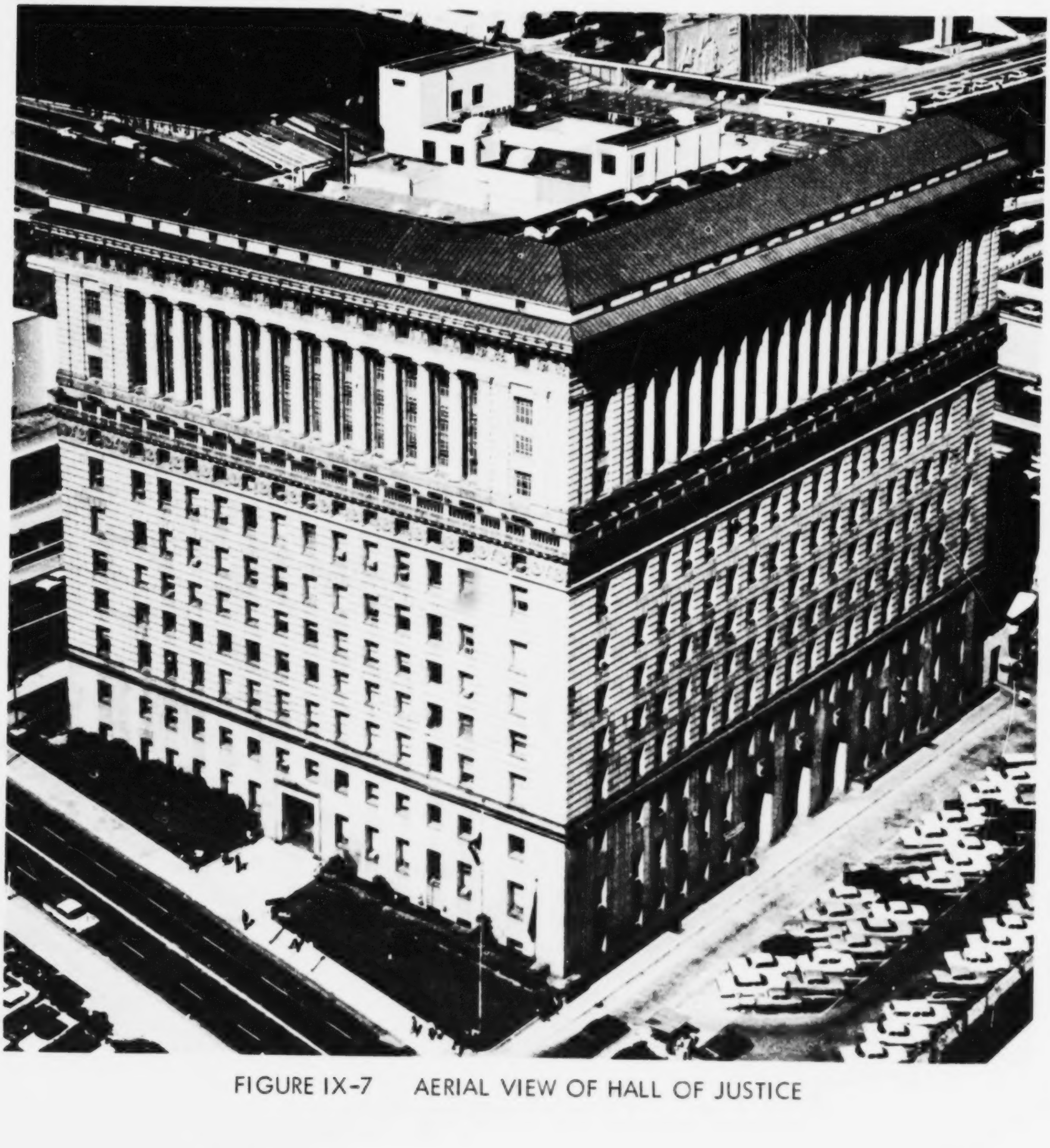


FIGURE IX-7 AERIAL VIEW OF HALL OF JUSTICE

TABLE IX-8 DESCRIPTION OF SOLID WASTE SYSTEM - HALL OF JUSTICE

| System Components | Types of Waste | | |
|---|---|---|---|
| | Soiled Linen | Garbage | Rubbish |
| Inter-Unit or Inter-Building: | | | |
| Internal Transfer | Elevator | Elevator | Elevator |
| Central Storage | Soiled Linen Room | Open Storage Room | Commercial Bins |
| Central Processing or Disposal | --- | --- | --- |
| Off-Site: | | | |
| External Transfer | Sheriff's Truck | Private Truck | Private Packer Truck |
| Final Processing and/or Disposal | Mira Loma Laundry | Hog Feeding | Private Landfill |
| TOTAL WASTES PRODUCED | | | |
| Avg. Daily Weight | 7,000 | 4,000 | 3,036 |
| % of Total | 49.9 | 28.5 | 21.6 |

of the waste system. Collection equipment is limited solely to hand carts and part-time use of a County truck for transport of soiled linen to the Mira Loma laundry for processing and return. Storage equipment is limited to miscellaneous cans and barrels.

Contract services provided by the private refuse contractor include furnishing 12 3-cubic yard containers for containment of rubbish with pickup daily. This material is hauled to area landfills for disposal. Costs of these services are at a rate of $336.00 monthly or equivalent to about $11.00 daily.

A private hauler also provides collection of about two tons of wet garbage daily. This material, stored in 16 gallon cans in the open garbage room, is transferred to a tank truck which hauls this salvage material to private hog farms for disposal. No charge to the County is made for collection or hauling this material.

Costs of building, equipment and contract services used in the waste system are estimated at less than $100 daily. In addition to the inmates' activity in waste handling, labor furnished by Building Services is estimated to range between $100 to $150 daily, with combined costs of the waste system approaching $200 to $250 daily.

Evaluation of Existing System Operation:

The summary description of the separate solid waste systems presented previously indicates that on-site handling of wastes is largely done by manual methods. The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

Table IX-9 presents the composite deficiency rating as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage and off-site disposal facilities.

TABLE IX-9 NUMERICAL RATING OF SOLID WASTE SYSTEM - HALL OF JUSTICE

| | System Components | | Soiled Linen | | Garbage | | Rubbish | | Total | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| Inter-Unit or Inter-Building System | Internal Transfer | Sanitation | 13 | 25 | 2 | 5 | 5 | 20 | 20 | 50 | 46 | 160 |
| | | Safety | 5 | 10 | 3 | 15 | 3 | 15 | 11 | 40 | | |
| | | Security | 2 | 5 | 2 | 10 | 3 | 15 | 7 | 30 | | |
| | | Esthetics | 3 | 15 | 2 | 10 | 3 | 15 | 8 | 40 | | |
| | Central Storage | Sanitation | 5 | 10 | 5 | 5 | 2 | 5 | 12 | 20 | 137 | 195 |
| | | Safety | 2 | 10 | 2 | 5 | 13 | 25 | 17 | 40 | | |
| | | Security | 10 | 20 | 10 | 10 | 30 | 30 | 50 | 60 | | |
| | | Esthetics | 10 | 20 | 25 | 25 | 23 | 30 | 58 | 75 | | |
| | Central Processing or Disposal | Sanitation | | 15 | | 20 | | 15 | | 50 | | 185 |
| | | Safety | | 10 | | 20 | | 20 | | 50 | | |
| | | Security | | 15 | | 10 | | 15 | | 40 | | |
| | | Esthetics | | 15 | | 15 | | 15 | | 45 | | |
| | Total | Sanitation | 18 | 50 | 7 | 30 | 7 | 40 | 32 | 120 | 183 | 540 |
| | | Safety | 7 | 30 | 5 | 40 | 16 | 60 | 28 | 130 | | |
| | | Security | 12 | 40 | 12 | 30 | 33 | 60 | 57 | 130 | | |
| | | Esthetics | 13 | 50 | 27 | 50 | 26 | 60 | 66 | 160 | | |
| Off-Site System | External Transfer | Sanitation | 5 | 20 | 5 | 20 | 1 | 5 | 11 | 45 | 41 | 195 |
| | | Safety | 3 | 15 | 3 | 15 | 5 | 20 | 11 | 50 | | |
| | | Security | 3 | 15 | 3 | 15 | 0 | 15 | 6 | 45 | | |
| | | Esthetics | 5 | 20 | 5 | 20 | 3 | 15 | 13 | 55 | | |
| | Final Processing and/or Disposal | Sanitation | 15 | 30 | 5 | 30 | 3 | 15 | 23 | 75 | 144 | 265 |
| | | Safety | 3 | 15 | 2 | 5 | 15 | 20 | 20 | 40 | | |
| | | Security | 5 | 25 | 15 | 15 | 25 | 25 | 45 | 65 | | |
| | | Esthetics | 15 | 30 | 22 | 30 | 19 | 25 | 56 | 85 | | |
| | Total | Sanitation | 20 | 50 | 10 | 50 | 4 | 20 | 34 | 120 | 185 | 460 |
| | | Safety | 6 | 30 | 5 | 20 | 20 | 40 | 31 | 90 | | |
| | | Security | 8 | 40 | 18 | 30 | 25 | 40 | 51 | 110 | | |
| | | Esthetics | 20 | 50 | 27 | 50 | 22 | 40 | 69 | 140 | | |
| | TOTAL | Sanitation | 38 | 100 | 17 | 80 | 11 | 60 | 66 | 240 | 368 | 1000 |
| | | Safety | 13 | 60 | 10 | 60 | 36 | 100 | 59 | 220 | | |
| | | Security | 20 | 80 | 30 | 60 | 58 | 100 | 108 | 240 | | |
| | | Esthetics | 33 | 100 | 54 | 100 | 48 | 100 | 135 | 300 | | |

VOL. II OBSERVATIONS OF LOCAL PRACTICES

## CHAP. X OFFICE BUILDINGS

Page No.

DESCRIPTION OF OFFICE BUILDING WASTE SYSTEMS X-1
  Common Characteristics of the Solid Waste Systems X-1

QUANTITIES OF WASTES GENERATED X-5

CONTRACT SERVICES X-7

BUILDING AND EQUIPMENT X-7

PERSONNEL REQUIREMENTS X-8

TOTAL ESTIMATED OPERATING COSTS X-10

EVALUATION OF EXISTING SYSTEM OPERATION X-10

### LIST OF TABLES

X-1 Characteristics of County Office Buildings X-1
X-2 Waste Production in County Office Buildings X-5
X-3 Description of Office Building Solid Waste Systems X-6
X-4 Contract Services for County Office Buildings X-7
X-5 Estimated Daily Labor Requirements and Costs of the Waste System X-9
X-6 Estimated Annual and Daily Costs of Office Building Waste Systems X-11
X-7 Numerical Rating of Office Building Solid Waste Systems X-12

### LIST OF FIGURES

X-1 Aerial View of Civic Center Complex X-2
X-2 Aerial View of County Engineers Building X-3

## DESCRIPTION OF OFFICE BUILDING WASTE SYSTEMS

Los Angeles County office buildings investigated during the course of this study included the Hall of Records, Hall of Administration, County Courthouse and County Engineers Building, all of which are situated in or adjacent to the downtown Civic Center Complex. The aerial photograph of the Civic Center, Figure X-1, illustrates the characteristics and relationship of the major buildings in this Complex. The County Engineers Building, located on the fringe of this Complex and not appearing in the previous photograph, is shown in detail in the aerial view, Figure X-2. Comparison of the basic characteristics of these buildings are presented in Table X-1.

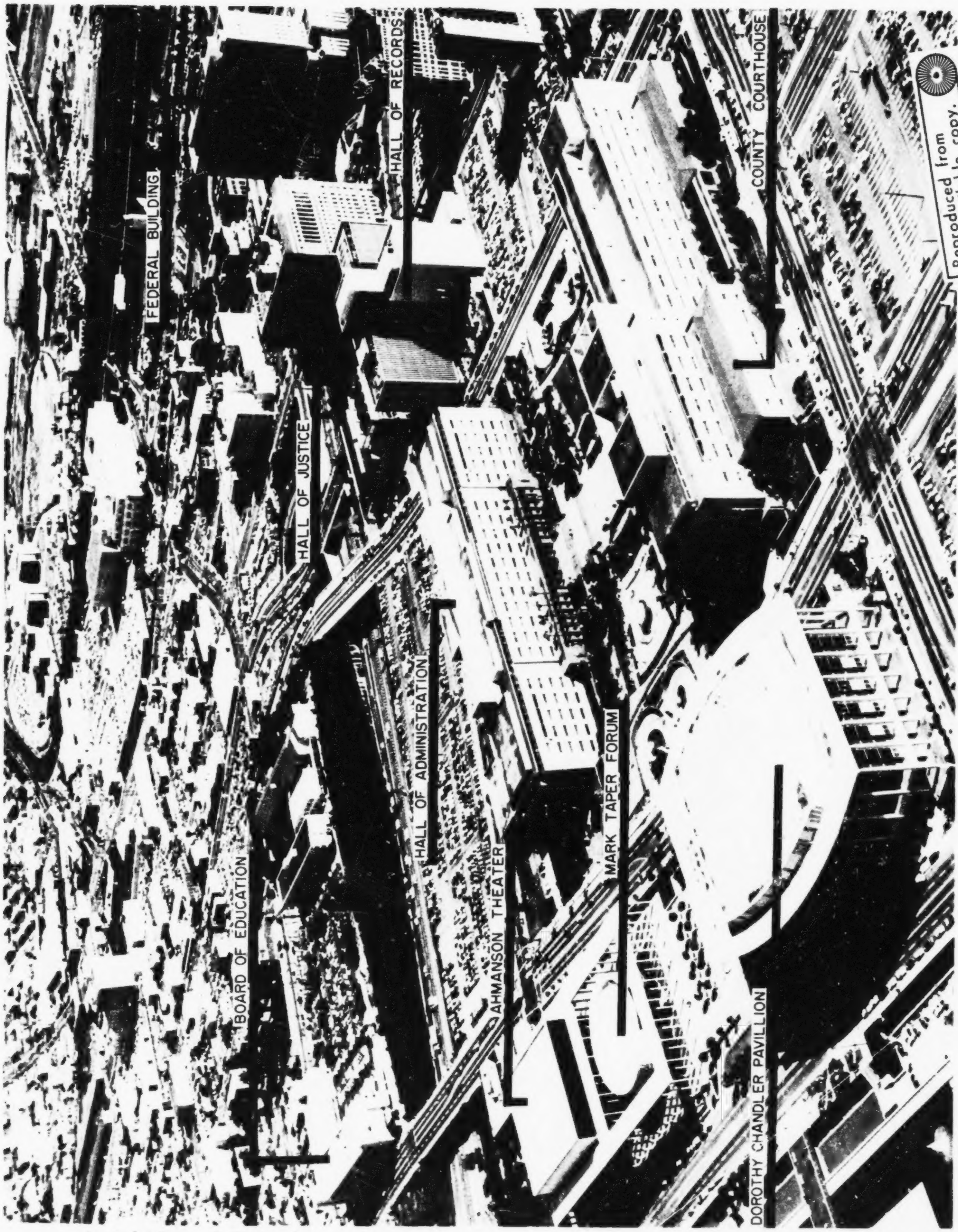
TABLE X-1 CHARACTERISTICS OF COUNTY OFFICE BUILDINGS

| | Hall of Records | Hall of Administration | County Courthouse | County Engineers |
|---|---|---|---|---|
| Building Area (Sq. Ft.) | 404,000 | 1,000,000 | 660,000 | 171,000 |
| No. of Floors | 17 | 10 | 9 | 11 |
| No. of Employees | 1,370 | 3,250 | 1,360 | 757 |

Common Characteristics of the Solid Waste Systems:

Field observations were conducted in December of 1968 and the early months of 1969 at these office buildings to determine (1) daily quantities of solid wastes produced, (2) equipment and services provided for handling and disposal of waste materials, (3) methods and practices employed, and (4) costs of the system operation. Although considerable variation in size and configuration exists in these buildings, the characteristics of the solid waste systems and management employed are the same at each building.

The County's Department of Building Services is charged with general custodial and housekeeping services at all County office buildings. Included in these functions is


FEDERAL BUILDING
HALL OF RECORDS
COUNTY COURTHOUSE
HALL OF JUSTICE
HALL OF ADMINISTRATION
BOARD OF EDUCATION
AHMANSON THEATER
MARK TAPER FORUM
DOROTHY CHANDLER PAVILLION

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Aerial View of Civic Center Complex

FIGURE X-1

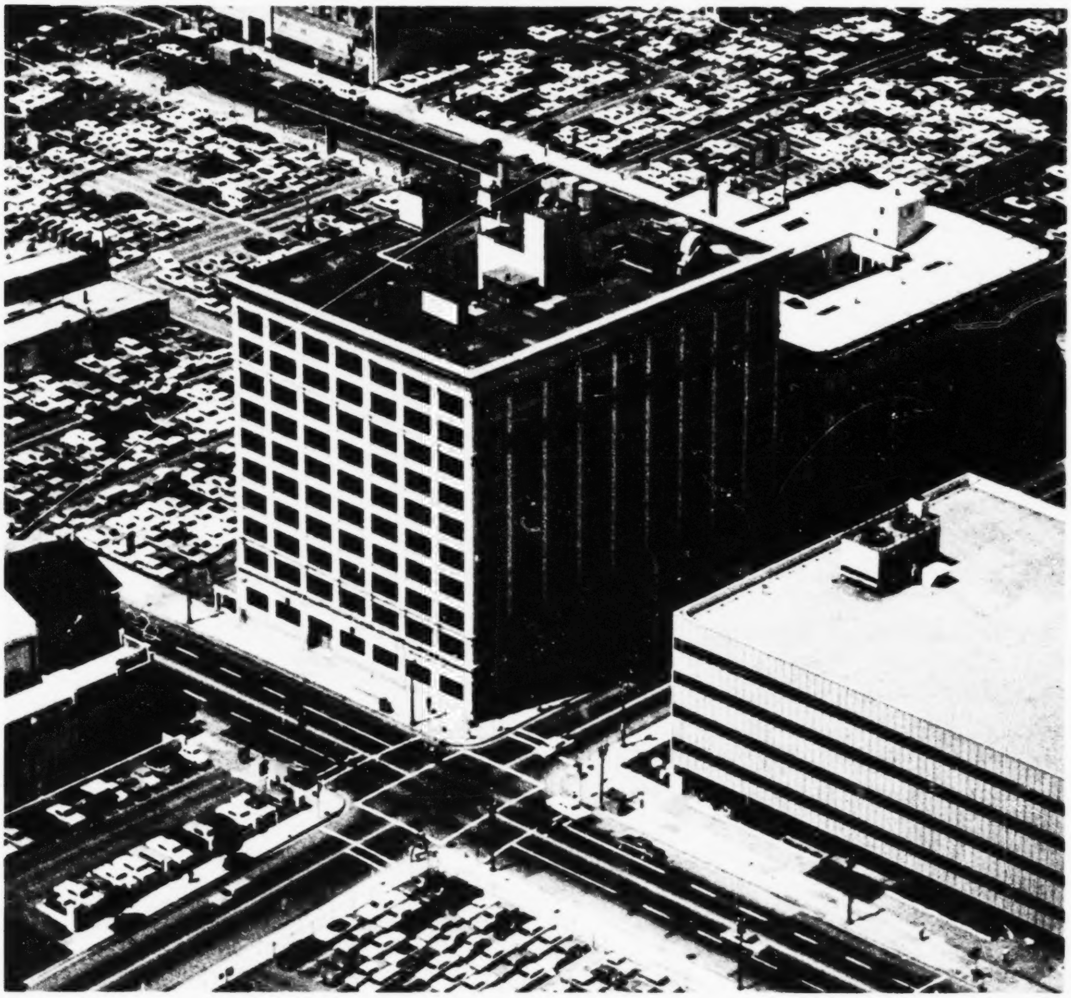

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FIGURE X-2 AERIAL VIEW OF COUNTY ENGINEERS BUILDING

the responsibility of solid waste management. This department is guided by a housekeeping program installed by *Key Systems in each of the major buildings. This program details work functions by building areas, crew assignments and manpower requirements. It is a systematized approach to the performance of daily maintenance functions, with specified manpower in a limited period of time. The functions of solid waste handling are intermingled with major custodial work tasks by areas. Therefore, estimates on labor requirements for these waste handling functions were made by actual observations of the performance of labor.

Segregation of waste materials is neither attempted in the building waste systems nor does it seem warranted. Relatively small quantities of waste materials are generated when compared to the large production of residence facilities such as the hospitals and detention facilities previously studied. These waste materials are also more uniform in nature, predominantly paper intermingled with small amounts of food wastes and non-combustibles. These latter materials are intermixed as collected and only one waste output is identifiable, namely rubbish. Variable quantities of food preparation wastes are disposed of by kitchen grinders where cafeteria facilities are provided. Other food wastes from kitchens or concessions are intermixed with rubbish.

Rubbish is generally collected in custodial carts as office areas are cleaned. Accumulations of material are transported via corridors and transferred to larger containers to await transfer via elevator to central storage areas or bins on the service level. Private refuse contractors service all office buildings, in some cases providing both commercial storage bins and hauling service. Ultimate disposal is by deposit in area landfills.

The following sections of this chapter will present pertinent data on each of these buildings, including quantities of wastes generated daily, estimated costs of the waste systems, description of each system and evaluation of the operation.

*Key Systems - A professional consulting service on building management functions

## QUANTITIES OF WASTES GENERATED

During the observation period, a quantity survey of waste materials was conducted over a five day period at each of these facilities. Accumulations of containerized materials were weighed at central storage locations using portable scales. Typical daily collections of wastes at each building are shown in Table X-2, with production related to building area (calculated in pounds per thousand square feet).

TABLE X-2 WASTE PRODUCTION IN COUNTY OFFICE BUILDINGS

| Building | Building Area (SF) | Typical Daily Production | | |
|---|---|---|---|---|
| | | Total (Lbs.) | Lbs./MSF | Lbs./Capita |
| Hall of Records | 404,000 | 1,000 | 2.5 | 0.7 |
| Hall of Administration | 1,000,000 | 2,560 | 2.6 | 0.8 |
| County Courthouse | 660,000 | 1,750 | 2.6 | 1.3 |
| County Engineers | 171,000 | 840 | 4.9 | 1.1 |

Details of the individual waste systems of these buildings are shown in Table X-3. It will be noted that limited variations in methods and practices occur between these building systems.

## TABLE X-3 DESCRIPTION OF OFFICE BUILDING SOLID WASTE SYSTEMS

| System Components | Hall of Records | Hall of Administration | County Courthouse | County Engineers |
|---|---|---|---|---|
| UNIT SYSTEM: | | | | |
| Initial Deposit (Receiver) | Unlined Cans | Open Container | Open Container | Unlined Cans |
| Initial Transfer | Manual | Hand Cart | Hand Cart | Manual |
| Initial Storage, Processing, Disposal | Barrel on Cart | Commercial Bin | Corridor | Barrel on Cart |
| INTER-UNIT SYSTEM: | | | | |
| Internal Transfer | Elevator | Elevator | Motorized Cart | Elevator |
| Central Storage | Trash Room | Loading Dock | Trash Room | Bins in Corridor |
| Central Processing or Disposal | --- | --- | --- | --- |
| OFF-SITE SYSTEM: | | | | |
| External Transfer | Packer Truck | Packer Truck | Packer Truck | Packer Truck |
| Final Processing and/or Disposal | Landfill | Landfill | Landfill | Landfill |
| DAILY WASTE PRODUCED (Lbs.) | 1,000 | 2,560 | 1,750 | 840 |

## CONTRACT SERVICES

A local refuse contractor services all of these office buildings, providing containers, hauling and disposal at private landfills, with collection six days per week. The range of services for each of these buildings is shown in Table X-4.

TABLE X-4 CONTRACT SERVICES FOR COUNTY OFFICE BUILDINGS

| Building | Containers Furnished | | | Cost of Services | |
|---|---|---|---|---|---|
| | No. | Type | Size | Monthly | *Daily |
| Hall of Records | 40 | Bbls. | 55 gal. | $120.00 | $ 4.60 |
| Hall of Administration | 11 | Bins | 3 CY | 300.00 | 11.50 |
| County Courthouse | 6 | Bins | 3 CY | 150.00 | 5.75 |
| County Engineers | 3 | Bins | 3 CY | 84.00 | 3.22 |

*Daily Cost 6 Days/Week or 26 Days/Month

Average daily costs of containers furnished and serviced are equivalent to about $0.33 per day per cubic yard ($1.00 per day per bin or $0.11 per day per barrel) on a volume basis. Relating these costs to daily weight of refuse indicates unit costs consistently range under $10.00 per ton for this service.

## BUILDING AND EQUIPMENT

Limited building areas for storage are provided for the exclusive use of the solid waste systems in the Hall of Records and County Courthouse. However, special facilities are not provided in either the Hall of Administration or the County Engineers Building. Collection equipment is limited to miscellaneous hand carts in all buildings, with the exception of the County Courthouse, where the part-time use of a motorized cart is used in collection of wastes from each floor. In all cases, freight elevators are used in the vertical transport of containerized wastes. Storage equipment is limited to miscellaneous bins and cans in all buildings.

## PERSONNEL REQUIREMENTS

As in other types of buildings studied, labor requirements for the operation of conventional solid waste systems in office buildings are the greatest cost factor. In these County office buildings, personnel of the Building Services Department perform all in-building functions of the solid waste system in conjunction with other custodial duties, during a normal workshift from 4:30 p.m. to 12:30 a.m., while buildings are generally unoccupied. From observations, it was found that daily waste collection activities required from 11% to 33% of the available time of the custodial crews assigned to the various buildings. Observations of daily routines indicated that 85% to 95% of the time required for operation of the waste system was spent on floor collection activities with the balance of time devoted to the movement of this material to central storage locations. Table X-5 provides a comparison of waste production, building area, labor requirements and costs of the in-building waste system at these buildings. This analysis indicates equivalent unit labor costs,ranging from about $0.14 to $0.23 per pound for the in-building collection and movement of waste materials, occur in these building systems.

## TABLE X-5 ESTIMATED DAILY LABOR REQUIREMENTS AND COSTS OF THE WASTE SYSTEM

| | Hall of Records | Hall of Administration | County Courthouse | County Engineers |
|---|---|---|---|---|
| Daily Waste Production (Lbs.) | 1,000 | 2,560 | 1,750 | 840 |
| Building Area (Sq. Ft.) | 404,000 | 1,000,000 | 660,000 | 171,000 |
| CREW DATA: | | | | |
| No. of Custodians | 23 | 94 | 69 | 19 |
| Available Man Hrs./Day | 184 | 752 | 572 | 152 |
| REQUIREMENTS OF WASTE SYSTEM: | | | | |
| Unit System (Man Hrs.) | 52.9 | 85.0 | 56.6 | 37.6 |
| Inter-Unit System (Man Hrs.) | 8.0 | 8.0 | 8.0 | 1.6 |
| Total System (Man Hrs.) | 60.9 | 93.0 | 64.6 | 39.2 |
| % of Available Man Hrs. | 33.1 | 12.4 | 11.3 | 25.7 |
| Equivalent Mandays | 7.6 | 11.6 | 8.1 | 4.9 |
| Collection - Pounds/Man Hr. | 16.4 | 27.5 | 27.0 | 21.5 |
| Area Coverage - Sq. Ft./Man Hr. | 6,700 | 10,800 | 10,200 | 4,300 |
| *ESTIMATED LABOR COSTS: | | | | |
| Unit System | $ 196 | $ 315 | $ 210 | $ 139 |
| Inter-Unit System | $ 30 | $ 30 | $ 30 | $ 6 |
| Total System Cost | $ 226 | $ 345 | $ 240 | $ 145 |
| Cost/Ton | $ 452 | $ 274 | $ 275 | $ 345 |
| Cost/Pound | $ 0.226 | $ 0.137 | $ 0.138 | $ 0.173 |

*Based on Average Hourly Rate of $3.71 including Payroll Taxes, Insurance, Social and Fringe Benefits.

## TOTAL ESTIMATED OPERATING COSTS

The foregoing text described the functions of the relatively simple solid waste systems at the County office buildings under study and noted the limited equipment involved in systems operation. The principal costs of operation of these conventional systems is that of labor, averaging about 90% of total costs in these buildings investigated. A summary of the estimated annual and daily expenses of the individual building systems based on the foregoing data is shown in Table X-6.

## EVALUATION OF EXISTING SYSTEM OPERATION

The summary description of the solid waste systems of these buildings presented previously indicates that on-site handling of wastes is largely done by manual methods. The evaluation of on-site handling is basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials for movement and the conditions of storage facilities.

Table X-7 presents the composite deficiency rating on each of these building systems as developed by the project staff and follows the format established in the introductory section of this volume. This evaluation was based on prevailing practices during observations in early 1969. Proper interpretation of the individual waste systems will indicate those areas of the system where remedial measures should be considered. Close review of this rating indicates that major deficiencies are largely limited to on-site storage and off-site disposal facilities.

TABLE X-6 ESTIMATED ANNUAL AND DAILY COSTS OF OFFICE BUILDING WASTE SYSTEMS

| Building Identification and Cost Elements | System Components - Estimated Annual Cost of Operation | | | | | Avg. Cost Per Day(2) |
|---|---|---|---|---|---|---|
| | Unit | Inter-Unit | Off-Site | Total | | |
| | | | | Cost | % | |
| HALL OF RECORDS | | | | | | |
| Building and Equipment (1) | $ 2,600 | $ 2,600 | $ -0- | $ 5,200 | 7.9 | $ 20 |
| Contract Services | -0- | -0- | 1,440 | 1,440 | 2.2 | 6 |
| Labor | 51,028 | 7,717 | -0- | 58,745 | 89.9 | 226 |
| Total | $53,628 | $10,317 | $1,440 | $ 65,385 | 100.0 | $252 |
| HALL OF ADMINISTRATION | | | | | | |
| Building and Equipment(1) | $ 5,200 | $ 5,200 | $ -0- | $ 10,400 | 10.1 | $ 40 |
| Contract Services | -0- | -0- | 3,600 | 3,600 | 3.5 | 14 |
| Labor | 81,991 | 7,717 | -0- | 89,708 | 86.4 | 345 |
| Total | $87,191 | $12,917 | $3,600 | $103,708 | 100.0 | $399 |
| COUNTY COURTHOUSE | | | | | | |
| Building and Equipment(1) | $ 3,250 | $ 3,250 | $ -0- | $ 6,500 | 8.6 | $ 25 |
| Contract Services | -0- | -0- | 1,800 | 1,800 | 2.4 | 8 |
| Labor | 54,600 | 7,717 | -0- | 62,317 | 89.0 | 240 |
| Total | $57,850 | $10,967 | $1,800 | $ 70,617 | 100.0 | $273 |
| COUNTY ENGINEERS | | | | | | |
| Building and Equipment(1) | $ 1,950 | $ 1,950 | $ -0- | $ 3,900 | 9.2 | $ 15 |
| Contract Services | -0- | -0- | 1,008 | 1,008 | 2.5 | 5 |
| Labor | 36,270 | 1,539 | -0- | 37,809 | 88.3 | 145 |
| Total | $38,220 | $ 3,489 | $1,008 | $ 42,717 | 100.0 | $165 |

(1) Includes allowances for applicable costs of building, equipment and/or expendable supplies

(2) All costs related to a 5-day week basis or 260 days per year

## NUMERICAL RATING OF OFFICE BUILDING SOLID WASTE SYSTEMS

| | | | HALL OF RECORDS | | | | HALL OF ADMINISTRATION | | | | COUNTY COURTHOUSE | | | | ENGINEERS BUILDING | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System Components | | | RUBBISH | | Total | | RUBBISH | | Total | | RUBBISH | | Total | | RUBBISH | | Total | |
| | | | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Valus | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value | Def. Value | Max. Value |
| UNIT SYSTEM | Initial Deposit (Receiver) | Sanitation | 2 | 10 | 9 | 40 | 2 | 10 | 9 | 40 | 2 | 10 | 9 | 40 | 2 | 10 | 9 | 40 |
| | | Safety | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | |
| | | Security | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | |
| | | Esthetics | 5 | 20 | | | 5 | 20 | | | 5 | 20 | | | 5 | 20 | | |
| | Initial Transfer | Sanitation | 2 | 10 | 5 | 30 | 2 | 10 | 5 | 30 | 2 | 10 | 5 | 30 | 2 | 10 | 5 | 30 |
| | | Safety | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | |
| | | Security | 0 | 5 | | | 0 | 5 | | | 0 | 5 | | | 0 | 5 | | |
| | | Esthetics | 2 | 10 | | | 2 | 10 | | | 2 | 10 | | | 2 | 10 | | |
| | Initial Storage, Processing, Disposal | Sanitation | 1 | 5 | 21 | 55 | 1 | 5 | 21 | 55 | 1 | 5 | 26 | 55 | 1 | 5 | 14 | 55 |
| | | Safety | 3 | 15 | | | 3 | 15 | | | 3 | 15 | | | 3 | 15 | | |
| | | Security | 7 | 15 | | | 7 | 15 | | | 7 | 15 | | | 0 | 15 | | |
| | | Esthetics | 10 | 20 | | | 10 | 20 | | | 15 | 20 | | | 10 | 20 | | |
| | Total | Sanitation | 5 | 25 | 35 | 125 | 5 | 25 | 35 | 125 | 5 | 25 | 40 | 125 | 5 | 25 | 28 | 125 |
| | | Safety | 5 | 25 | | | 5 | 25 | | | 5 | 25 | | | 5 | 25 | | |
| | | Security | 8 | 25 | | | 8 | 25 | | | 8 | 25 | | | 1 | 25 | | |
| | | Esthetics | 17 | 50 | | | 17 | 50 | | | 22 | 50 | | | 17 | 50 | | |
| INTER-UNIT SYSTEM | Internal Transfer | Sanitation | 5 | 25 | 13 | 60 | 5 | 25 | 22 | 60 | 5 | 25 | 21 | 60 | 5 | 25 | 13 | 60 |
| | | Safety | 3 | 15 | | | 7 | 15 | | | 11 | 15 | | | 3 | 15 | | |
| | | Security | 0 | 10 | | | 5 | 10 | | | 0 | 10 | | | 0 | 10 | | |
| | | Esthetics | 5 | 10 | | | 5 | 10 | | | 5 | 10 | | | 5 | 10 | | |
| | Central Storage | Sanitation | 5 | 10 | 23 | 75 | 5 | 10 | 53 | 75 | 5 | 10 | 30 | 75 | 5 | 10 | 70 | 75 |
| | | Safety | 5 | 25 | | | 13 | 25 | | | 5 | 25 | | | 25 | 25 | | |
| | | Security | 8 | 30 | | | 30 | 30 | | | 15 | 30 | | | 30 | 30 | | |
| | | Esthetics | 5 | 10 | | | 5 | 10 | | | 5 | 10 | | | 10 | 10 | | |
| | Central Processing or Disposal | Sanitation | | 15 | | 40 | | 15 | | 40 | | 15 | | 40 | | 15 | | 40 |
| | | Safety | | 10 | | | | 10 | | | | 10 | | | | 10 | | |
| | | Security | | 10 | | | | 10 | | | | 10 | | | | 10 | | |
| | | Esthetics | | 5 | | | | 5 | | | | 5 | | | | 5 | | |
| | Total | Sanitation | 10 | 50 | 36 | 175 | 10 | 50 | 75 | 175 | 10 | 50 | 51 | 175 | 10 | 50 | 83 | 175 |
| | | Safety | 8 | 50 | | | 20 | 50 | | | 16 | 50 | | | 28 | 50 | | |
| | | Security | 8 | 50 | | | 35 | 50 | | | 15 | 50 | | | 30 | 50 | | |
| | | Esthetics | 10 | 25 | | | 10 | 25 | | | 10 | 25 | | | 15 | 25 | | |
| OFF-SITE SYSTEM | External Transfer | Sanitation | 2 | 10 | 5 | 30 | 2 | 10 | 5 | 30 | 2 | 10 | 8 | 30 | 2 | 10 | 5 | 30 |
| | | Safety | 2 | 10 | | | 2 | 10 | | | 5 | 10 | | | 2 | 10 | | |
| | | Security | 0 | 5 | | | 0 | 5 | | | 0 | 5 | | | 0 | 5 | | |
| | | Esthetics | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | | 1 | 5 | | |
| | Final Processing and/or Disposal | Sanitation | 3 | 15 | 50 | 70 | 3 | 15 | 50 | 70 | 3 | 15 | 50 | 70 | 3 | 15 | 50 | 70 |
| | | Safety | 12 | 15 | | | 12 | 15 | | | 12 | 15 | | | 12 | 15 | | |
| | | Security | 20 | 20 | | | 20 | 20 | | | 20 | 20 | | | 20 | 20 | | |
| | | Esthetics | 15 | 20 | | | 15 | 20 | | | 15 | 20 | | | 15 | 20 | | |
| | Total | Sanitation | 5 | 25 | 55 | 100 | 5 | 25 | 55 | 100 | 5 | 25 | 58 | 100 | 5 | 25 | 55 | 100 |
| | | Safety | 14 | 25 | | | 14 | 25 | | | 17 | 25 | | | 14 | 25 | | |
| | | Security | 20 | 25 | | | 20 | 25 | | | 20 | 25 | | | 20 | 25 | | |
| | | Esthetics | 16 | 25 | | | 16 | 25 | | | 16 | 25 | | | 16 | 25 | | |
| | TOTAL | Sanitation | 20 | 100 | 126 | 400 | 20 | 100 | 165 | 400 | 20 | 100 | 149 | 400 | 20 | 100 | 166 | 400 |
| | | Safety | 27 | 100 | | | 39 | 100 | | | 38 | 100 | | | 47 | 100 | | |
| | | Security | 36 | 100 | | | 63 | 100 | | | 43 | 100 | | | 51 | 100 | | |
| | | Esthetics | 43 | 100 | | | 43 | 100 | | | 48 | 100 | | | 48 | 100 | | |

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## VOL. II OBSERVATIONS OF LOCAL PRACTICES

## CHAP. XI SUMMARY AND CONCLUSIONS

Page No.

RESTATEMENT OF PURPOSE AND SCOPE OF STUDY XI-1

SOLID WASTE SYSTEMS IN COUNTY HOSPITALS XI-3

SOLID WASTE SYSTEMS IN DETENTION FACILITIES XI-15

SOLID WASTE SYSTEMS IN COUNTY OFFICE BUILDINGS XI-22

SUMMARY XI-26
  Prevailing Problems in Solid Waste Management in Buildings XI-26
  Causes of Problems XI-28
  Required Development of Remedial Measures XI-28
  Continuing Studies XI-30

### LIST OF TABLES

Comparison of Hospital Solid Waste Systems

XI-1 Breakdown of Daily Waste Production (Lbs./Day) By Types of Waste XI-4
XI-2 Characteristics of Hospital Plants and Daily Waste Production XI-5
XI-3 Percentage Distribution of Systems Operating Costs XI-7
XI-4 Daily Labor Requirements for Systems Operation (Man-Minutes per Bed Patient) XI-9
XI-5 Annual, Daily and Unit Operating Costs XI-10
XI-6 Percentage Deficiencies in Environmental Rating of Systems Operations XI-11
XI-7 Percentage Deficiencies of Sub-System Functions XI-13
XI-8 Relationship of Waste Production, Labor Requirements and System Deficiencies by Individual Wastes XI-14

## LIST OF TABLES

Comparison of Detention Facility Solid Waste Systems

XI-9 Descriptive Characteristics of Detention Facilities XI-16
XI-10 Breakdown of Daily Waste Production (Lbs./Day) By Types of Waste XI-17
XI-11 Contract Services for County Detention Facilities XI-19
XI-12 Percentage Deficiencies in Systems Operations XI-20
XI-13 Relationship of Waste Production and System Deficiencies XI-21

Comparison of Office Building Solid Waste Systems

XI-14 Waste Production and Costs of Operation XI-23
XI-15 Percentage Deficiencies in Systems Operations XI-25

Volume II has presented a comprehensive review, inventory and evaluation of existing solid waste systems and solid waste management practices in a substantial cross section of County-owned and operated building complexes within the County of Los Angeles. In review of this volume of material, the following digest has been prepared restating the purpose and scope of the total study, as well as briefly summarizing investigations conducted at these local institutions and other selected locations.

## RESTATEMENT OF PURPOSE AND SCOPE OF STUDY

The ultimate purpose of the total study is to determine improved solid waste handling, storage, processing and/or disposal techniques adaptable to various types of multistory buildings and building complexes. In connection with these objectives, a comprehensive investigation of existing systems, methods, and practices in various types and sizes of buildings was required as the initial phase of study. A wide range of building classifications was initially considered. However, due to anticipated details of study and time limitations, only three basic building classifications were approved for study within the scope of the contract. These classifications, hospitals, detention facilities and office buildings, were selected based on their diverse functions and apparent differences in solid waste system requirements. Selection of the individual projects included seven hospitals, five detention facilities and four office buildings. Extreme variations in physical configurations, functions and waste system requirements also existed in those projects selected within each building classification.

Separate survey methods and report formats were developed for each building classification to record and convey pertinent data on identification of the existing solid waste systems, classification of wastes, quantities of waste production, operating characteristics and cost analysis of the systems, as well as evaluation of the environmental effect of systems operation within each plant and the community at large.

On-site observations at each project were conducted to obtain the necessary field information to perform these tasks. The foregoing chapters have presented comprehensive detail of these observations. Chapters II through VIII presented individual reviews on the relatively complex hospital solid waste systems, and Chapters IX and X, respectively, presented studies of systems operations at detention facilities and office buildings. Similarity of waste system characteristics within these latter building categories permitted the presentation of the investigations in an abbreviated form by building categories rather than individual projects. A summary of these project reports are incorporated herein.

## SOLID WASTE SYSTEMS IN COUNTY HOSPITALS

Investigations of all the selected County hospitals were conducted during the latter months of 1968 and early 1969 to determine physical characteristics of the plants and develop data on the solid waste systems. Diverse conditions found to exist among nearly all plants ranged not only from the physical characteristics of location, land, buildings and plant layout, but also to the predominant types of care and specialties each facility offers.

Initial field observations were carried out at each of these hospitals to determine average daily quantities and types of wastes produced. Observations ranged from a period of five days to two weeks at these plants, depending on the size and complexity of the waste system operation. Weight records were developed on all major types of disposable wastes through the use of portable scales. Daily weight records of soiled linen were obtained from laundry records for all hospitals. Results of these observations were compiled and typical daily activity was estimated for each plant as shown in Table XI-1. This Table provides the breakdown of daily waste production by type of waste and summarizes total daily production by the broad categories of disposable and reusable waste materials, as well as certain calculated unit production factors (daily bed patient and per capita production). Although waste production in hospitals is commonly reduced to the familiar "pounds per bed patient unit", the results of this study of the seven local hospitals have shown an extremely wide range in unit production when analyzed on this basis. This analysis suggests that for estimating purposes in the design of solid waste systems, calculations of total wastes based on bed patient capacity alone may be misleading and that further investigations should be made relating production to other plant and building characteristics.

An example of the wide range in waste quantities generated when analyzed on daily production/bed patient/day can best be illustrated by a comparison between Long Beach General Hospital and the LAC/USC Medical Center as shown on Table XI-1. Long Beach, a geriatrics center, offers a type of patient care that requires limited specialties limited space, limited supplies, limited staff and support personnel as opposed to the requirements of the Medical Center. The Medical Center is one of the major general teaching hospitals in the country. This institution provides a comprehensive range of medical care for all age groups. Highly specialized services require a complex plant with a high ratio of specialized building areas, supplies, staff and support personnel. With such varying conditions, it can best be summarized that types of wastes produced and respective quantities of each are to a great extent dependent upon the classification of the hospital (range and type of care), ratio of bed patients to equivalent population, and management policy on reusable and single-use items.

Comparison of Hospital Solid Waste Systems

TABLE XI-1 BREAKDOWN OF DAILY WASTE PRODUCTION (LBS./DAY) BY TYPES OF WASTE

| Type of Waste | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital |
|---|---|---|---|---|---|---|---|
| Sharps, Needles, Etc. | 75 | 3 | 22 | 40 | 8 | 20 | 5 |
| Path. & Surgical | 1,000 | TR | 156 | 4 | 115 | 6 | TR |
| Soiled Linen (R) | 45,500 | 3,740 | 13,600 | 16,320 | 2,900 | 5,630 | 1,120 |
| Rubbish | 16,200 | 540 | 6,569 | 2,760 | 717 | 1,722 | 362 |
| Reusable Patient Items (R) | TR | TR | TR | TR | TR | TR | TR |
| Non-Combustibles | 1,500 | 75 | 465 | 725 | 80 | 250 | 80 |
| Garbage (Non-Grindable)* | 1,800 | 150 | 660 | 875 | 160 | 475 | 110 |
| Food Service Items (R) | 9,000 | 1,400 | 2,400 | 4,200 | 800 | 2,500 | 600 |
| Radiological | TR | - | TR | TR | - | TR | - |
| Ash & Residue | TR | - | 20 | 20 | 50 | 20 | 25 |
| Animal Carcasses | 25 | - | 220 | 20 | 10 | 23 | - |
| Food Waste (Grindable) | 2,600 | 330 | 950 | 1,100 | 210 | 1,860 | 150 |
| TOTAL PRODUCTION | 77,700 | 6,238 | 25,062 | 26,064 | 5,050 | 12,506 | 2,452 |
| DAILY PRODUCTION DISPOSABLE | 23,200 | 1,098 | 9,062 | 5,544 | 1,350 | 4,376 | 732 |
| Pounds per Bed Patient | 11.6 | 3.6 | 16.7 | 6.0 | 7.9 | 7.8 | 5.1 |
| Pounds per ** Capita | 3.75 | 2.08 | 5.57 | 2.80 | 3.44 | 4.32 | 3.37 |
| DAILY PRODUCTION REUSABLE (R) | 54,500 | 5,140 | 16,000 | 20,520 | 3,700 | 8,130 | 1,720 |
| Pounds per Bed Patient | 27.2 | 16.9 | 29.6 | 22.1 | 21.7 | 14.5 | 11.9 |
| Pounds per ** Capita | 8.75 | 9.74 | 9.73 | 10.20 | 9.41 | 8.08 | 7.93 |

*Predominantly Garbage Mixed with Substantial Quantities of Paper, Plastics, Metal, Etc.

**Per Capita Production Based on Equiv. 24-Hr. Population

Table XI-2 was prepared relating total waste production to building area, gross population (total patients, outpatients, employees, volunteer workers, etc.), and *equivalent population (average population present each 8 hour shift over 24 hours per day and 7 days per week).

Comparison of Hospital Solid Waste Systems

TABLE XI-2 CHARACTERISTICS OF HOSPITAL PLANTS AND DAILY WASTE PRODUCTION

| | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital | Range of Production (4) |
|---|---|---|---|---|---|---|---|---|
| Total Building Area (MSF) | 2,822.0 | 195.4 | 665.8 | 1,191.0 | 140.3 | 510.1 | 91.1 | |
| Bed Patient Capacity | 2,300 | 428 | 688 | 1,540 | 259 | 699 | 232 | |
| Ratio of Area (SF) per Patient | 1,220 | 455 | 965 | 775 | 540 | 730 | 390 | |
| Avg. Occupancy-Bed Patients(1) | 2,018 | 302 | 541 | 929 | 170 | 560 | 144 | |
| Occupancy Rate | 87.4% | 70.5% | 78.6% | 60.3% | 65.5% | 80.4% | 62.1% | |
| Gross Population(2) | 21,294 | 1,246 | 5,512 | 5,471 | 1,124 | 2,452 | 453 | |
| Equivalent 24-Hr. Pop. (3) | 6,220 | 526 | 1,645 | 1,982 | 392 | 1,012 | 217 | |
| Ratio of Patients to Equiv. Pop. | 32.3% | 57.4% | 32.8% | 46.7% | 43.4% | 55.0% | 66.5% | |
| Total Daily Waste Production (Lbs.) | 77,700 | 6,238 | 25,062 | 26,064 | 5,050 | 12,506 | 2,452 | |
| Lbs./MSF of Bldg. Area | 25.6 | 32.0 | 32.5 | 21.9 | 36.0 | 24.5 | 27.0 | 64% |
| Lbs./Bed Patient | 38.8 | 20.5 | 46.3 | 28.1 | 29.7 | 22.3 | 17.0 | 172% |
| Lbs./Person-Gr. Pop. | 3.7 | 5.0 | 4.5 | 4.8 | 4.5 | 5.1 | 5.4 | 46% |
| Lbs./Capita-Equiv. Pop. | 12.50 | 11.82 | 15.30 | 13.30 | 12.85 | 12.40 | 11.30 | 35% |
| Total Disposables (Lbs.) | 23,200 | 1,098 | 9,062 | 5,544 | 1,350 | 4,376 | 732 | |
| Lbs./MSF of Bldg. Area | 7.5 | 5.6 | 10.7 | 4.7 | 9.6 | 8.6 | 8.2 | 128% |
| Lbs./Bed Patient | 11.6 | 3.6 | 16.7 | 6.0 | 7.9 | 7.8 | 5.1 | 364% |
| Lbs./Person-Gr. Pop. | 1.1 | 0.8 | 1.6 | 1.0 | 1.2 | 1.8 | 1.6 | 125% |
| Lbs./Capita-Equiv. Pop. | 3.75 | 2.08 | 5.57 | 2.80 | 3.44 | 4.32 | 3.37 | 168% |
| Total Reusables (Lbs.) | 54,500 | 5,140 | 16,000 | 20,520 | 3,700 | 8,130 | 1,720 | |
| Lbs./MSF of Bldg. Area | 18.1 | 26.4 | 21.8 | 17.2 | 26.4 | 15.9 | 18.8 | 66% |
| Lbs./Bed Patient | 27.2 | 16.9 | 29.6 | 22.1 | 21.7 | 14.5 | 11.9 | 149% |
| Lbs./Person-Gr. Pop. | 2.6 | 4.2 | 2.9 | 3.8 | 3.3 | 3.3 | 3.8 | 62% |
| Lbs./Capita-Equiv. Pop. | 8.75 | 9.74 | 9.73 | 10.20 | 9.41 | 8.08 | 7.93 | 29% |

(1) Avg. Occupancy During Observation Period
(2) Gross Population Including Total Bed Patients, Outpatients, Employees, Volunteer Workers
(3) Equivalent Population is Average Shift Population Present 24 Hours per Day, 7 Days per Week
(4) Range in Production Over Lowest Production Factor

| *Example of Calculations | Monday-Friday | | | Saturday and Sunday | | |
|---|---|---|---|---|---|---|
| | 1st Shift | 2nd Shift | 3rd Shift | 1st Shift | 2nd Shift | 3rd Shift |
| Total Est. Population/Shift | 13,400 | 5,100 | 4,300 | 5,000 | 3,500 | 3,500 |
| Avg. Shift & Daily Pop. | 7,100 | | | 4,000 | | |

Equivalent Population = 5/7 (7,100) + 2/7 (4,000) = 5,075 + 1,145 = 6,220

A comparison of these calculated production factors, as shown in Table XI-2, indicates the following range in production occurring in the seven hospitals studied:

Lbs./MSF of Bldg. Area - Ranging 64% above the low of 21.9 Lbs./MSF

Lbs. per Bed Patient - Ranging 172% above the low of 17.0 Lbs./Bed Patient

Lbs./Person (Gross Pop.) - Ranging 46% above the low of 3.7 Lbs./Person

Lbs./Capita (Equiv. Pop.) - Ranging 35% above the low of 11.3 Lbs./Capita

This analysis indicates that estimates of waste production may be more accurately projected by using a per capita production factor related to equivalent population than the other production factors considered above. This analysis shows a range of 11.3 to 15.3 pounds per capita, including both disposable and reusable waste classifications, was generated daily at these hospitals studied. Table XI-2 also shows the calculated unit production factors individually for disposable and reusable waste classifications. Except for the distortion caused by the relatively low production level of disposable waste materials at Long Beach General Hospital, comparison of these factors further supports the theory that per capita production factors related to equivalent population provides the more reliable basis for estimating.

Continuing observations at these institutions were devoted to investigations of equipment and services provided for handling and disposal of solid wastes, and methods and practices employed, all as a basis for determination of costs of operation and evaluation of the systems.

Labor requirements were found to be the most significant factor in systems operation, consistently ranging above 90% of total operating costs. Table XI-3 illustrates the percentage distribution of costs represented by labor, building and fixed equipment, vehicular equipment, contractor or disposal fees, and miscellaneous expendable supplies. Percentage distribution of costs to the categories of reusable and disposable materials indicate a wide range of cost experience, some, such as Long Beach, with costs nearly in direct proportion to quantity of waste production, opposed to the cost experience of Harbor General, which is nearly in inverse proportion to quantities of reusables and disposables. In addition, total system costs are distributed to the

## TABLE XI-3 PERCENTAGE DISTRIBUTION OF SYSTEMS OPERATING COSTS

| | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital |
|---|---|---|---|---|---|---|---|
| | % of Costs | % of Costs | % of Costs | % of Costs | % of Costs | % of Costs | % of Costs |
| SYSTEM COMPONENT | | | | | | | |
| Unit System | 75.8 | 85.0 | 84.4 | 87.6 | 84.4 | 85.3 | 75.0 |
| Inter-Unit System | 14.1 | -0- | 6.0 | 2.5 | 7.8 | 3.9 | 18.0 |
| Inter-Building System | 4.3 | 10.0 | 5.2 | 9.1 | 7.8 | 9.7 | 5.0 |
| Off-Site System | 5.8 | *5.0 | 4.4 | .8 | *TR | 1.1 | *2.0 |
| Total System | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| COST ELEMENTS OF TOTAL SYSTEM | | | | | | | |
| Bldg. & Fixed Equip. | 1.0 | -0- | .4 | .2 | .4 | .1 | .5 |
| Maint. & Repairs | 0.3 | -0- | .1 | -0- | .1 | .1 | .1 |
| Vehicular Equip. Carts | 0.4 | -0- | .3 | .4 | TR | .2 | TR |
| Oper. & Maint. | 1.2 | -0- | 1.2 | 1.3 | TR | 1.0 | TR |
| Contract or Disposal Fees | 0.7 | 1.1 | .3 | .3 | .1 | .2 | .2 |
| Misc. Expendable Supplies | 1.5 | 6.4 | 1.9 | 2.2 | 6.2 | 1.9 | 4.2 |
| Sub-Total | 5.1 | 7.5 | 4.2 | 4.4 | 6.8 | 3.5 | 5.0 |
| Labor | 94.9 | 92.5 | 95.8 | 95.6 | 93.2 | 96.5 | 95.0 |
| Total System | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| CLASSIFICATION OF WASTE | | | | | | | |
| Disposable | 54.1 | 29.2 | 69.3 | 56.2 | 55.5 | 55.0 | 42.5 |
| Reusable | 45.9 | 70.8 | 30.7 | 43.8 | 44.5 | 45.0 | 57.5 |
| Total System | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*Contract Services

sub-systems or system components (Unit, Inter-Unit, Inter-Building, and Off-Site system). It is of interest to note that the on-floor handling of waste (the Unit system) consistently ranges from 75 to 87.6% of total system costs.

To further signify the magnitude of labor in the systems operation, daily manpower requirements have been resolved to man minutes per bed patient as observed at each institution and shown in Table XI-4. Review of the individual description of solid waste systems and estimated daily labor costs of solid waste systems presented in the respective chapters will provide detail of these labor requirements at each institution.

Table XI-5 was prepared to relate estimated total costs of the system operation to quantities of waste produced. Unit cost data on a per ton basis, as well as on a bed patient day basis, has been calculated for comparison between hospitals.

The findings of this study, limited to detailed investigations at only seven hospitals, suggest that variations in labor requirements and total costs of operation are dependent largely on physical complexities of the plant layout and equipment employed, as well as the skill and inclination of labor. Development and evaluation of the foregoing statistics, together with observations of waste systems operation at these plants, further emphasize the diverse characteristics of these institutions and their respective waste systems.

The evaluation of these institutional waste systems was based on observations over a continuing period of several months. These observations were concluded with the preparation of a numerical rating on operational efficiency of the individual systems related to the environmental factors of sanitation, safety, security and esthetics. Detailed ratings of the individual hospital waste systems were previously presented in the respective chapters on each project (Table identification - "Numerical Rating of Hospital Solid Waste Systems"). In summary form, Tables XI-6, XI-7 and XI-8 were prepared to relate the more pertinent factors in these ratings. Table XI-6 shows the weighted deficiency rating of the total waste system operation as related to the four environmental factors.

TABLE XI-4 DAILY LABOR REQUIREMENTS FOR SYSTEMS OPERATION (Man-Minutes per Bed Patient)

| System Component | LAC-USC Medical Center | | Long Beach General Hospital | | Harbor General Hospital | | Rancho Los Amigos Hospital | | John Wesley Hospital | | Olive View Hospital | | Mira Loma Hospital | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Man-Min. | % of Total | Man-Min. | % of Total | Man-Min. | % of Total | Man-Min. | % of Total | Man-Min. | % of Total | Man-Min. | % of Total | Man-Min. | % of Total |
| Unit System | 37 | 77.2 | 28 | 90.4 | 54 | 87.1 | 28 | 91.0 | 58 | 89.3 | 53 | 89.8 | 39 | 75.0 |
| Inter-Unit System | 7 | 14.4 | - | - | 4 | 6.5 | 1 | 3.0 | 4 | 6.1 | 2 | 3.4 | 11 | 21.2 |
| Inter-Building System | 2 | 4.2 | 3 | 9.6 | 2 | 3.2 | 2 | 6.0 | 3 | 4.6 | 4 | 6.8 | 2 | 3.8 |
| Off-Site System | 2 | 4.2 | *0 | 0 | 2 | 3.2 | TR | TR | *0 | 0 | TR | TR | *0 | 0 |
| TOTAL SYSTEM | 48 | 100.0 | 31 | 100.0 | 62 | 100.0 | 31 | 100.0 | 65 | 100.0 | 59 | 100.0 | 52 | 100.0 |

*Contract Services

Comparisons of Hospital Solid Waste Systems

## TABLE XI-5 ANNUAL, DAILY AND UNIT OPERATING COSTS

| | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital |
|---|---|---|---|---|---|---|---|
| QUANTITY OF WASTES PRODUCED: | | | | | | | |
| Disposables (Tons/Day) | 11.60 | 0.55 | 4.53 | 2.77 | 0.68 | 2.19 | 0.37 |
| Reusables (Tons/Day) | 27.25 | 2.57 | 8.00 | 10.26 | 1.85 | 4.06 | 0.86 |
| Total Waste (Tons/Day) | 38.85 | 3.12 | 12.53 | 13.03 | 2.53 | 6.25 | 1.23 |
| COST OF SYSTEM OPERATION: | | | | | | | |
| Annual | $2,396,850 | $223,600 | $777,435 | $656,340 | $296,582 | $750,585 | $175,200 |
| Daily | $ 6,566 | $ 612 | $ 2,130 | $ 1,798 | $ 813 | $ 2,056 | $ 480 |
| AVERAGE DAILY COST PER TON: | | | | | | | |
| Disposables | $ 305 | $ 325 | $ 327 | $ 364 | $ 664 | $ 516 | $ 551 |
| Reusables | $ 110 | $ 168 | $ 82 | $ 77 | $ 195 | $ 229 | $ 322 |
| Total Wastes | $ 170 | $ 197 | $ 170 | $ 138 | $ 321 | $ 329 | $ 390 |
| AVERAGE DAILY COST/BEDPATIENT: | | | | | | | |
| Disposables | $ 1.76 | $ 0.58 | $ 2.73 | $ 1.09 | $ 2.65 | $ 2.02 | $ 1.42 |
| Reusables | $ 1.49 | $ 1.44 | $ 1.21 | $ .85 | $ 2.13 | $ 1.65 | $ 1.91 |
| Total Wastes | $ 3.25 | $ 2.02 | $ 3.94 | $ 1.94 | $ 4.78 | $ 3.67 | $ 3.33 |

TABLE XI-6 PERCENTAGE DEFICIENCIES IN ENVIRONMENTAL RATING OF SYSTEMS OPERATIONS

| Environmental Factor | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital |
|---|---|---|---|---|---|---|---|
| Sanitation | 63 | 25 | 40 | 14 | 31 | 40 | 27 |
| Safety | 50 | 24 | 37 | 16 | 25 | 33 | 25 |
| Security | 59 | 24 | 27 | 19 | 18 | 34 | 32 |
| Esthetics | 57 | 28 | 42 | 26 | 26 | 35 | 35 |
| Weighted Avg. | 58 | 25 | 37 | 20 | 26 | 36 | 29 |

Table XI-7 expresses these ratings in percentage of deficiencies within sub-system or system components and functions within the components. Weighted average deficiencies as shown in Tables XI-6 and XI-7 are composite deficiency ratings calculated from the numerical rating Tables presented in Chapters II-VIII. For example, in the case of the LAC-USC Medical Center, the percentage deficiencies of the environmental factors, as shown in Table XI-6, were calculated from Table II-18 (page II-53) as follows:

| | | | |
|---|---|---|---|
| Sanitation | 1050/1675 | = | 63% |
| Safety | 544/1080 | = | 50% |
| Security | 546/925 | = | 59% |
| Esthetics | 364/620 | = | 57% |
| Weighted Avg. | 2504/4300 | = | 58% |

The percentage deficiencies of sub-system functions as shown in Table XI-7 were calculated in a similar manner. For example, referring again to Table II-18, total deficiencies of the Unit system were calculated as follows:

| | | | |
|---|---|---|---|
| Initial Deposit | 217/415 | = | 52.3% |
| Initial Transfer | 212/440 | = | 50.5% |
| Initial Storage, Proc.& Disposal | 267/430 | = | 62.1% |
| Weighted Avg. | 696/1265 | = | 55.0% |

Table XI-8 illustrates the rated deficiencies in handling individual wastes at each hospital and also shows the relationship of individual waste quantities produced, as well as labor requirements of each within the systems.

By review of the descriptions of the solid waste systems (individual project reports), it is indicated that on-site handling of wastes is largely done by manual methods. The rating of on-site handling is therefore basically an assessment of the capabilities of labor in movement of the various types of wastes, the preparation of these materials and the conditions of storage facilities. These evaluations were based on prevailing practices observed at each facility during the observation period, and in accordance with the evaluation procedures outlined in the introductory section of this report. In close review of the numerical ratings of each hospital waste system, major deficiencies are found to generally prevail in storage functions, vertical transfer, inter-building transfer and off-site disposal, all of which are associated with the principal disposable wastes (sharps, rubbish, non-combustibles) as well as on-site handling of linen. Recommendations for upgrading these systems (Volume III) will consider these broad needs as well as specific deficiencies within the respective systems of each facility.

## TABLE XI-7 PERCENTAGE DEFICIENCIES OF SUB-SYSTEM FUNCTIONS

| Sub-System and Function | LAC-USC Medical Center | Long Beach General Hospital | Harbor General Hospital | Rancho Los Amigos Hospital | John Wesley Hospital | Olive View Hospital | Mira Loma Hospital |
|---|---|---|---|---|---|---|---|
| UNIT SYSTEM: | | | | | | | |
| Initial Deposit | 52.3 | 38.1 | 50.8 | 20.7 | 31.8 | 47.0 | 37.3 |
| Initial Transfer | 50.5 | 27.6 | 47.6 | 6.2 | 27.9 | 35.0 | 20.5 |
| Initial Storage | 62.1 | 43.0 | 33.3 | 37.9 | 30.2 | 35.3 | 51.6 |
| Weighted Average | 55.0 | 36.0 | 44.0 | 22.0 | 30.0 | 39.0 | 37.0 |
| INTER-UNIT SYSTEM: | | | | | | | |
| Vertical Transfer | 41.2 | - | 38.8 | - | 36.6 | - | - |
| Intermediate Storage | 62.2 | - | 25.6 | 35.5 | 11.8 | 64.5 | 25.4 |
| Weighted Average | 52.0 | - | 32.0 | 19.0 | 24.0 | 34.0 | 13.0 |
| INTER-BUILDING SYSTEM: | | | | | | | |
| Internal Transfer | 54.9 | 19.4 | 37.7 | 16.3 | 24.6 | 27.1 | 22.3 |
| Central Storage | 74.8 | 39.4 | 54.8 | 8.3 | 35.1 | 13.2 | 39.3 |
| Central Proc. or Disp. | 67.4 | .5 | 2.7 | -0- | 4.1 | -0- | 2.5 |
| Weighted Average | 68.0 | 19.0 | 31.0 | 8.0 | 21.0 | 13.0 | 21.0 |
| OFF-SITE SYSTEM: | | | | | | | |
| External Transfer | 23.3 | 11.3 | 14.9 | 6.2 | 6.2 | 16.0 | 10.5 |
| Final Proc. or Disp. | 71.8 | 45.1 | 45.1 | 35.6 | 34.9 | 69.5 | 49.2 |
| Weighted Average | 60.0 | 37.0 | 38.0 | 28.0 | 28.0 | 56.0 | 40.0 |
| TOTAL SYSTEM | 58.0 | 25.0 | 37.0 | 20.0 | 26.0 | 36.0 | 29.0 |

TABLE XI-8 RELATIONSHIP OF WASTE PRODUCTION, LABOR REQUIREMENTS AND SYSTEM DEFICIENCIES BY INDIVIDUAL WASTES

| | LAC-USC Medical Center | | | Long Beach General Hospital | | | Harbor General Hospital | | | Rancho Los Amigos Hospital | | | John Wesley Hospital | | | Olive View Hospital | | | Mira Loma Hospital | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Waste | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. | % of Prod. | % of Labor | % Def. |
| Sharps, Needles, Etc. | .1 | 6.1 | 76 | .1 | 1.7 | 44 | .1 | 1.2 | 63 | .2 | 3.0 | 16 | .2 | 8.9 | 49 | .2 | 1.1 | 53 | .1 | 2.4 | 39 |
| Path. & Surgical | 1.3 | .4 | 81 | TR | .3 | 9 | 1.5 | 2.6 | 11 | .1 | .5 | 15 | 2.4 | 4.5 | 13 | .3 | .4 | 35 | TR | .8 | 34 |
| Soiled Linen | 58.6 | 19.3 | 54 | 59.9 | 41.5 | 27 | 54.2 | 20.3 | 41 | 62.6 | 33.8 | 22 | 57.4 | 15.2 | 31 | 45.1 | 28.5 | 35 | 45.6 | 42.2 | 26 |
| Rubbish | 20.9 | 37.9 | 58 | 8.7 | 8.6 | 29 | 26.2 | 55.3 | 43 | 10.6 | 42.8 | 35 | 14.1 | 29.4 | 21 | 13.6 | 45.8 | 39 | 14.8 | 23.9 | 20 |
| Reusable Patient Items | TR | 5.2 | 8 | TR | 1.6 | 8 | TR | 1.0 | 8 | TR | 1.6 | 9 | TR | 2.2 | 42 | TR | .7 | 16 | TR | 4.4 | 14 |
| Non-Combustibles | 1.8 | 6.2 | 50 | 1.2 | 2.2 | 29 | 2.0 | 3.4 | 42 | 2.9 | 2.3 | 22 | 2.6 | 7.7 | 31 | 2.2 | .7 | 41 | 4.4 | 2.4 | 37 |
| Garbage (Non-Grindable) | 2.3 | 2.9 | 59 | 2.4 | 3.2 | 24 | 2.6 | 1.9 | 35 | 3.3 | 2.1 | 24 | 3.2 | 2.7 | 19 | 3.7 | 1.5 | 32 | 4.5 | 6.0 | 28 |
| Food Service Items | 11.6 | 20.2 | 38 | 22.4 | 30.4 | 8 | 9.6 | 12.4 | 23 | 16.1 | 11.8 | 10 | 15.8 | 27.8 | 12 | 20.0 | 17.3 | 7 | 24.4 | 14.3 | 18 |
| *Radiological | TR | .1 | - | - | - | - | TR | .5 | - | TR | TR | - | - | - | - | TR | .1 | - | - | - | - |
| Food Waste (Grindable) | 3.4 | 1.7 | - | 5.3 | 10.5 | - | 3.8 | 1.4 | - | 4.2 | 2.1 | - | 4.2 | 1.6 | - | 14.9 | 3.9 | - | 6.2 | 3.6 | - |
| TOTAL SYSTEM | 100.0 | 100.0 | 58 | 100.0 | 100.0 | 25 | 100.0 | 100.0 | 37 | 100.0 | 100.0 | 20 | 100.0 | 100.0 | 26 | 100.0 | 100.0 | 36 | 100.0 | 100.0 | 29 |
| Disposable Waste | 29.8 | 55.3 | 69 | 17.7 | 26.5 | 28 | 36.2 | 66.3 | 41 | 21.3 | 52.8 | 22 | 26.8 | 54.8 | 29 | 34.9 | 53.5 | 42 | 30.0 | 39.1 | 33 |
| Reusable Waste | 70.2 | 44.7 | 37 | 82.3 | 73.5 | 17 | 63.8 | 33.7 | 27 | 78.7 | 47.2 | 15 | 73.2 | 45.2 | 19 | 65.1 | 46.5 | 23 | 70.0 | 60.9 | 21 |

*Not Included in Numerical Rating

## SOLID WASTE SYSTEMS IN DETENTION FACILITIES

Investigations of solid waste systems in County detention facilities, as reported in Chapters VIII and IX (Volume II), were conducted during the early months of 1969 to observe the physical characteristics of the plants and develop data on the solid waste systems. Institutions investigated included the Mira Loma Rehabilitation and Detention Facility, Central Jail, Sybil Brand Institute, San Fernando Valley Juvenile Hall and the Hall of Justice.

Considerable variations exist in function, size, population and types of inmates at these institutions. Table XI-9 provides a comparison of the varying physical characteristics of these institutions. Considerable variations were also found in the rate of waste production. However, types of wastes produced, and methods and practices employed in their respective solid waste systems, were very similar. Table XI-10 shows the comparison of total waste production by individual types of wastes and relates this production to building area and various population factors. By comparison with Table XI-2 (page XI-5), it will be noted, that as in hospitals, per capita unit production related to equivalent population shows a lessor variation in the range of production. It also suggests that for estimating and analysis of waste production quantities, this per capita factor may be more reliable and meaningful than use of other factors.

Functions of the Unit System are confined to individual cell block, dormitory and departmental activities generally performed by inmate occupants or work details. Observations of these in-plant housekeeping functions were of limited nature and not considered significant to this study. Detailed observations were generally confined to the Inter-Unit or Inter-Building and Off-Site systems.

The three basic categories of wastes found in these detention facilities (soiled linen, garbage and rubbish) are each handled in separate channels. Descriptions of the separate solid waste systems at each of these institutions presented in Chapters VIII and IX detailed the system activities. Although the operation of these systems in detention facilities relies heavily on labor, it cannot be classified as the principal cost factor, as in conventional systems in other types of buildings. In fact, by comparison to other types of buildings, cost

Comparison of Detention Facility Solid Waste Systems

## TABLE XI-9 DESCRIPTIVE CHARACTERISTICS OF DETENTION FACILITIES

| | Mira Loma | Central Jail | Sybil Brand Institute | San Fernando Juvenile Hall | Hall of Justice |
|---|---|---|---|---|---|
| No. of Buildings | 40 | 1 | 6 | 18 | 1 |
| Range of Story Heights | 1 | 2-6 | 2-4 | 1 & 2 | 12-14 |
| Building Area (Sq. Ft.) | 268,900 | 750,000 | 230,340 | 208,700 | 539,000 |
| Inmate Capacity | 533 | 3,000 | 836 | 515 | 2,900 |
| Jail Personnel | 158 | 500 | 166 | 233 | 217 |
| Total Population(1) | 691 | 3,500 | 1,002 | 748 | 3,117 |
| Equivalent Population(2) | 571 | 3,120 | 876 | 570 | 2,952 |
| Ratio Inmates to Equiv. Pop. | 93% | 96% | 95% | 91% | 98% |
| Type Inmate | Adult (M) | Adult (M) | Adult (F) | Juvenile (F & M) | Adult (M) |

(1) Gross Population Includes all Employees and Inmates

(2) Equivalent Population Includes Average No. Employees and Inmates Present Each Shift 24 Hours/Day, 7 Days/Week

Comparison of Detention Facility Solid Waste Systems

## TABLE XI-10 BREAKDOWN OF DAILY WASTE PRODUCTION (LBS./DAY) BY TYPES OF WASTE

| | Mira Loma | Central Jail | Sybil Brand Institute | San Fernando Juvenile Hall | Hall of Justice | Range Prod.(3) |
|---|---|---|---|---|---|---|
| REUSABLE WASTE: | | | | | | |
| Soiled Linen | 2,174 | 12,000 | 1,756 | 895 | 7,000 | |
| DISPOSABLE WASTES: | | | | | | |
| Rubbish | 810 | 4,200 | 1,217 | 1,360 | 3,036 | |
| Garbage | 1,140 | 7,420 | 1,367 | 1,300 | 4,000 | |
| TOTAL WASTES | 4,124 | 23,620 | 4,340 | 3,555 | 14,036 | |
| Lbs./MSF of Bldg. Area | 15.3 | 31.5 | 18.8 | 17.0 | 26.0 | 106% |
| Lbs./Inmate | 7.7 | 7.9 | 5.2 | 6.8 | 4.8 | 65% |
| Lbs./Person (1) | 5.9 | 6.7 | 3.4 | 4.7 | 4.5 | 97% |
| Lbs./Capita (2) | 7.2 | 7.6 | 4.9 | 6.3 | 4.8 | 58% |
| TOTAL DISPOSABLES | 1,950 | 11,620 | 2,584 | 2,660 | 7,036 | |
| Lbs./MSF of Bldg. Area | 7.2 | 15.5 | 11.2 | 12.7 | 13.0 | 115% |
| Lbs./Inmate | 3.6 | 3.9 | 3.1 | 5.1 | 2.4 | 113% |
| Lbs./Person (1) | 2.8 | 3.3 | 1.6 | 3.5 | 2.3 | 119% |
| Lbs./Capita (2) | 3.4 | 3.7 | 2.9 | 4.7 | 2.4 | 96% |
| TOTAL REUSABLES | 2,174 | 12,000 | 1,756 | 895 | 7,000 | |
| Lbs./MSF of Bldg. Area | 8.1 | 16.0 | 7.6 | 4.3 | 13.0 | 272% |
| Lbs./Inmate | 4.1 | 4.0 | 2.1 | 1.7 | 2.4 | 153% |
| Lbs./Person (1) | 3.1 | 3.4 | 1.8 | 1.2 | 2.2 | 183% |
| Lbs./Capita (2) | 3.8 | 3.9 | 2.0 | 1.6 | 2.4 | 144% |

(1) Based on Gross Population Including Total Inmates and Employees

(2) Equivalent Population is Average Shift Population Present 24 Hours per Day, 7 Days per Week

(3, Range in Production Over Lowest Production Factor elements of detention facility systems are insignificant. Table XI-11 was prepared to illustrate identifiable cost elements in the respective systems. In general, these consist of contract services providing storage bins, collection, hauling and off-site disposal at landfills. With the exception of the Hall of Justice where the County Department of Building Services assists in the Inter-Unit system, no other labor costs are acknowledged. Relating total identifiable costs to waste quantities indicates a modest range of about $0.01 to $0.02 per pound is incurred in the operation of the waste systems.

The evaluations of these detention facility waste systems were based on observations over a continuing period of several weeks. These observations were concluded with the preparation of a numerical rating on operational efficiency of the individual systems related to the environmental factors of sanitation, safety, security and esthetics. Detailed ratings of these systems were previously presented in Chapters VIII and IX. Summaries of these ratings have been prepared showing percentage deficiencies within the systems operation, as illustrated in Tables XI-12 and XI-13.

Table XI-12 expresses these ratings in percentage deficiencies within the system components and functions and shows the weighted deficiency rating related to the four environmental factors. Table XI-13 illustrates the rated deficiencies in handling individual wastes at each institution and the significance of quantities of each material.

These ratings, as in the case of hospital system ratings, were largely an assessment of the capabilities of labor in the movement of waste materials, the preparation of these materials and conditions of storage facilities. These evaluations were based on prevailing practices observed at each facility during the observation period in accordance with evaluation procedures outlined in the introductory section of this report. Review of the ratings indicate major deficiencies generally prevail in central storage and off-site disposal associated with the rubbish system.

Comparison of Detention Facility Solid Waste Systems

## TABLE XI-11 CONTRACT SERVICES FOR COUNTY DETENTION FACILITIES

| | Mira Loma | Central Jail | Sybil Brand Institute | *San Fernando Juvenile Hall | Hall of Justice |
|---|---|---|---|---|---|
| CONTAINERS FURNISHED: | | | | | |
| No. | 13 | 10 | 5 | - | 12 |
| Type | Comm. Bins | Comm. Bins | Comm. Bins | - | Comm. Bins |
| Size | 3 CY | 4 CY | 3 CY | - | 3 CY |
| COST OF SERVICES: | | | | | |
| Monthly | $351.00 | $342.00 | $150.00 | - | $336.00 |
| Daily | $ 11.70 | $ 11.40 | $ 5.00 | - | $ 11.25 |
| Type of Wastes Received | Gar. & Rub. | Rubbish | Gar. & Rub. | - | Rubbish |
| Tons of Waste Per Day | 1.0 | 2.1 | 1.3 | - | 1.5 |
| Cost per Cubic Yard | $ 0.30 | $ 0.29 | $ 0.33 | - | $ 0.31 |
| Cost per Ton | $ 11.70 | $ 5.45 | $ 3.75 | - | $ 7.50 |

Note: Contract Services include Furnishing Bins, Collection 6 Days/Week and Disposal by Landfill

*San Fernando Juvenile Hall - Open Storage of Rubbish on Loading Dock is Collected by Olive View Hospital Packer Truck

Comparison of Detention Facility Solid Waste Systems

## TABLE XI-12 PERCENTAGE DEFICIENCIES IN SYSTEMS OPERATIONS

| Sub-System and Functions | Mira Loma | Central Jail | Sybil Brand Institute | San Fernando Juvenile Hall | Hall of Justice |
|---|---|---|---|---|---|
| INTER-UNIT OR BUILDING SYSTEM: | | | | | |
| Internal Transfer | 32 | 29 | 25 | 22 | 29 |
| Central Storage | 61 | 31 | 44 | 49 | 70 |
| Central Processing or Disposal | 8 | - | 8 | - | - |
| Total | 36 | 20 | 26 | 24 | 34 |
| OFF-SITE SYSTEM: | | | | | |
| Internal Transfer | 7 | 21 | 9 | 24 | 21 |
| Final Processing and/or Disposal | 40 | 47 | 32 | 47 | 54 |
| Total | 26 | 36 | 22 | 37 | 40 |
| TOTAL SYSTEM | 32 | 27 | 24 | 30 | 37 |
| ENVIRONMENTAL FACTOR RATING: | | | | | |
| Sanitation | 16 | 25 | 15 | 22 | 28 |
| Safety | 27 | 21 | 20 | 25 | 27 |
| Security | 41 | 30 | 30 | 29 | 45 |
| Esthetics | 40 | 32 | 30 | 41 | 45 |

Comparison of Detention Facility Solid Waste Systems

## TABLE XI-13 RELATIONSHIP OF WASTE PRODUCTION AND SYSTEM DEFICIENCIES

| Type of Waste | Mira Loma | | Central Jail | | Sybil Brand Institute | | San Fernando Juvenile Hall | | Hall of Justice | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % of Prod. | % Def. | % of Prod. | % Def. | % of Prod. | % Def. | % of Prod. | % Def. | % of Prod. | % Def. |
| REUSABLE WASTE: | | | | | | | | | | |
| Soiled Linen | 52.7 | 14.0 | 50.8 | 26.0 | 40.5 | 14.0 | 25.2 | 24.0 | 49.9 | 31.0 |
| DISPOSABLE WASTES: | | | | | | | | | | |
| Rubbish | 19.6 | 47.0 | 17.7 | 34.0 | 28.0 | 36.0 | 38.3 | 42.0 | 21.6 | 43.0 |
| Garbage | 27.7 | 33.0 | 31.5 | 21.0 | 31.5 | 22.0 | 36.5 | 24.0 | 28.5 | 37.0 |
| TOTAL WASTES | 100.0 | 32.0 | 100.0 | 27.0 | 100.0 | 24.0 | 100.0 | 30.0 | 100.0 | 37.0 |

## SOLID WASTE SYSTEMS IN COUNTY OFFICE BUILDINGS

Investigations of the solid waste systems in County office buildings, as reported in detail in Chapter X, were conducted during December, 1968 and early months of 1969 to observe the physical characteristics of these buildings and develop data on the solid waste systems. Buildings invesrigated included the Hall of Records, Hall of Administration, County Courthouse and the County Engineers Building.

It may be summarized that these buildings, though varying in both function and size, are similar insofar as solid waste management is concerned, with the County Department of Building Services handling this function at each building. Similarity of in-building handling and storage methods prevails, as well as the similarity and range of contract services received at each facility. Table X-3 (page X-6), Description of Office Building Solid Waste Systems, presented earlier, details these activities. Tables XI-14 and XI-15 were prepared to illustrate other comparisons made of the waste systems operation.

Table XI-14 shows certain building characteristics, as well as average daily waste production and estimated operating costs of the systems calculated during the observation period. Production related to building areas shows an overall average of 2.8 pounds per MSF (thousand square feet) of building area is experienced in these buildings, with the County Engineers Building showing a substantially higher production at 4.9 Lbs./MSF. This higher rate was due to a large volume of blueprints being handled, which is not uncommon at this building. Costs of operation of these systems can be related to an average cost per ton at about $350, in a range of costs from $312 to $504 per ton. As in hospitals, labor was found to be the most significant cost factor in systems operation. Distribution of system costs reflects an average of about 88% in labor, 3% in contract services and 9% in building, equipment and accessories. Distribution of these costs to the system components shows an average of 83% expended in floor activities (the Unit system), 14% in between-floor handling (the Inter-Unit system), and 3% in the off-site system.

The evaluations of these office building waste systems were based on observations over a continuing period of several weeks. These observations were concluded with the preparation of a numerical rating on operational efficiency or deficiency of the individual systems related to the environmental factors of

Comparison of Office Building Solid Waste Systems

TABLE XI-14 WASTE PRODUCTION AND COSTS OF OPERATION

| | Hall of Records | Hall of Administration | County Courthouse | County Engineers |
|---|---|---|---|---|
| Building Area (Sq. Ft.) | 404,000 | 1,000,000 | 660,000 | 171,000 |
| No. of Floors | 17 | 10 | 9 | 11 |
| Daily Waste Production (Lbs.) | 1,000 | 2,560 | 1,750 | 840 |
| Daily Production (Lbs./MSF of Bldg. Area) | 2.5 | 2.6 | 2.6 | 4.9 |
| Annual Operating Costs | $ 65,385 | $ 103,708 | $70,617 | $42,717 |
| Avg. Daily Costs | $ 252 | $ 399 | $ 273 | 165 |
| | | | | |
| Cost per Ton | $ 504 | $ 312 | $ 312 | $ 393 |
| Cost per Lb. | $ 0.25 | $ 0.16 | $ 0.16 | $ 0.20 |
| | | | | |
| Distribution of Costs | | | | |
| Building & Equip. | 7.9% | 10.1% | 8.6% | 9.2% |
| Contract Services | 2.2% | 3.5% | 2.4% | 2.5% |
| Labor | 89.9% | 86.4% | 89.0% | 88.3% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% |
| | | | | |
| Distribution of Costs | | | | |
| Unit System | 82.2% | 84.0% | 82.0% | 89.4% |
| Inter-Unit System | 15.6% | 12.5% | 15.6% | 8.1% |
| Off-Site System | 2.2% | 3.5% | 2.4% | 2.5% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% |

sanitation, safety, security and esthetics. Detailed ratings of these systems were previously presented in Table X-7 (page X-12). Summaries of these ratings have been prepared showing percentage deficiencies in the systems components and functions and the weighted deficiency rating related to the four environmental factors, as illustrated in Table XI-15.

These ratings, as in the case of hospital system ratings, were largely an assessment of the capabilities of labor in the movement of waste materials, the preparation of these materials and conditions of storage facilities. These evaluations were based on prevailing practices observed at each facility during the observation period, in accordance with evaluation procedures outlined in the introductory section of this report.

Due to the uniform and relatively inoffensive nature of the waste materials handled, as well as the advantages of a single waste channel handling all waste materials, complexity in these waste systems is minimized. Satisfactory operation is limited only by the capability of plant facilities provided and accessory equipment used, as well as the skill and inclination of labor. By and large, labor performs effectively within these systems using very simple equipment. Custodial crews in office buildings, as opposed to hospitals, have the added advantage of working in unoccupied buildings in off-peak hours where productivity and supervision of labor can be satisfactorily controlled. The most significant deficiencies in these systems are in the functions of central storage and off-site disposal. Due to the nature of waste materials, system sanitation does not pose the severe problem as found in hospitals; however, conditions affecting safety, security and esthetics are of major significance.

Comparison of Office Building Solid Waste Systems

### TABLE XI-15 PERCENTAGE DEFICIENCIES IN SYSTEMS OPERATIONS

| | Hall of Records | Hall of Administration | County Courthouse | County Engineers |
|---|---|---|---|---|
| UNIT SYSTEM: | | | | |
| Initial Deposit (Receiver) | 22 | 22 | 22 | 22 |
| Initial Transfer | 17 | 17 | 17 | 17 |
| Initial Stor., Proc., Disposal | 38 | 38 | 47 | 25 |
| Total | 28 | 28 | 32 | 22 |
| INTER-UNIT SYSTEM: | | | | |
| Internal Transfer | 22 | 37 | 35 | 22 |
| Central Storage | 31 | 71 | 40 | 93 |
| Central Processing or Disposal | - | - | - | - |
| Total | 21 | 43 | 29 | 47 |
| OFF-SITE SYSTEM: | | | | |
| External Transfer | 17 | 17 | 27 | 17 |
| Final Processing or Disposal | 71 | 71 | 71 | 71 |
| Total | 55 | 55 | 58 | 55 |
| TOTAL SYSTEM | 31 | 41 | 37 | 42 |
| ENVIRONMENTAL FACTOR RATING: | | | | |
| Sanitation | 20 | 20 | 20 | 20 |
| Safety | 27 | 39 | 38 | 47 |
| Security | 36 | 63 | 43 | 51 |
| Esthetics | 43 | 43 | 48 | 48 |

## SUMMARY

In the course of this study, certain pioneering has been undertaken in the identification of building waste systems, adoption of nomenclature of sub-systems and functions within these systems, and development of methods of evaluation of waste system operation. These tasks were fundamental to the total study and were carried out to the stage of development which appeared adequate for the continuing phases of the study to progress. Hopefully, these preliminary efforts to develop standard terminology may be refined for practical application in the industry as may later be required. However, for purposes of this study, application of these basic principles have aided in the determination of requirements of the solid waste systems, provided the yardstick for measuring the efficiency or deficiency of systems operation, and provided a means of conveying these findings to the reader.

These findings have emphasized the prevailing problems of solid waste management and systems operation common in those local projects investigated, as well as common in other public and private facilities observed in other areas of the country.

### Prevailing Problems in Solid Waste Management in Buildings:

Probably the most important problem within solid waste management in complex buildings is lack of knowledge or awareness of an identifiable and indispensable system, what it costs to operate and a method of measuring its effectiveness. In most cases, there is an established policy on handling waste materials but in practice the actual operation of the waste system rarely corresponds to that policy.

Until recently, the total solid waste system as such within buildings has been ignored and is not yet commonly recognized or even easily identifiable. Little research has been carried out to explore the in-building problems associated with solid wastes. These waste materials have been looked upon as a by-product of our activities, of little significance, just something to "get-rid-of", with little real concern how that may be accomplished; when, in fact in a way, waste is the end material product of our activities. This can best be comprehended when we realize the simple fact that sooner or later nearly all material products are converted to waste. In the case of consumable supplies, our principal daily source of wastes, this conversion is represented by a constant daily flow of waste materials. With this in mind, the basic concept of solid waste for this study was based on the principle that the majority of materials entering an institutional building and distributed for use are converted to wastes in a continuing flow, with all solid wastes cycled out in a reverse pattern from distribution of new supplies. This concept also applies to those reusable items that may be cycled out after use for either on-site or off-site reprocessing.

Certain variations of this concept occur, dependent on the building type and functions, such as hospitals where certain biological wastes may be generated within the institution, and office buildings where many of the supplies when processed are dispatched to an ultimate off-site receiver.

Recent emphasis on the environmental effect of solid wastes, both in-plant and to the community at large, has brought to the surface many problems heretofore ignored or unrecognized. Progress in building design, accompanied by the increase of multistory complexes and higher density of land use, as well as increasing per capita rates of waste production, have tended to create large concentrations of solid wastes at limited accumulation points in building service areas where access for removal is limited. These conditions have further emphasized the material handling problems associated with the in-building movement of solid waste materials, on-site storage and disposal or off-site transfer for disposal.

Causes of Problems:

Prior to the current era of growing awareness of the solid waste problem in buildings, design consideration for handling waste materials has, at best, largely been limited to the location of conventional waste chutes and storage rooms, even in the more sophisticated building designs, primarily because this was the only equipment and method available. Consequently, the problems that exist in these buildings today are inherent to design.

It can be recognized that manually working a conventional solid waste system may be a distasteful and dirty job. This will be a certainty without direct policies and standards of operation coupled with conscientious working supervisors and trained crew members to produce the desired standards.

Reasonable standards of operation can be expected where building maintenance activities can be performed in off-peak hours or when buildings are vacant, such as the services prevailing in office buildings. By contrast, performance of these activities in hospitals coincides with peak activities of other functions during the first shift operation. Depending on the complexities of plant layout and traffic congestion, close surveillance and supervision of operation of the solid waste system within reasonable economic limits is unlikely, and reasonable standards of operation are difficult to maintain consistently. This substandard operation, though directly the failure of labor to perform a satisfactory job, can be traced further to the inadequacies of system design to meet present day requirements.

Required Development of Remedial Measures:

Generally, the standards of performance of manual tasks in connection with collection and storage of wastes in the Unit System are at present totally dependent on policies and housekeeping practices and are not likely to be remedied through mechanization. However, within present day technology, it would appear that substantial mechanization of the balance of the system is feasible and that solutions to the more critical problems will ultimately be in the design of buildings. A coordinated and massive attack by architects and engineers, coupled with firm operating and administrative policy of building management, may well be what it takes to stimulate these solutions.

These solutions, through design, may be accelerated through recognition of the overall effect of operation of inadequate systems, both from environmental and economic aspects.

Further tightening of codes and regulations that recognize and control environmental problems of the community and building occupants can be expected when the effects of solid waste system operation are positively related to existing environmental hazards.

The investor (developer, owner or operator) must be made aware of the economic benefits that may result from the mechanized system. Cost studies of mechanized systems will, of course, reveal that initial capital investment requirements will far exceed the cost of conventional systems. However, development of complete cost data showing comparisons of total annual costs (capital and operating expenses) and the economic feasibility of the mechanized system opposed to the conventional system may provide the investment incentive to expand the construction budget.

The solid waste system must be popularly recognized as a requisite mechanical equipment component in building design and given early consideration in the preliminary design stages (the same consideration given to plumbing, air conditioning, heating, ventilating, etc.) in order to integrate another vital function in an orderly manner. With complex building layouts providing high density occupancy and correspondingly, high rates of waste production, periodic consultations with specialists in the fields of industrial engineering, materials handling engineering and solid waste management may be desirable and beneficial from the preliminary design stage throughout the design process. Design consideration should also be given to multiple purpose material handling systems to handle both new supplies and waste materials.

In short, the problems must be solved in the same manner as industry mechanized production lines several decades ago.

It is vital that design standards be developed for solid waste systems in various types of buildings. These standards should be adequate not only for present levels of waste production but must also consider present trends affecting increases in rates of waste production for certain types of buildings.

System design must provide flexibility for modification and expansion to meet potentially large increases in waste production which are likely to result from the adoption of single-use disposables, as well as the natural increase of wastes being experienced annually. As indicated in the hospital studies, conversion from reusable to disposable linen may increase the loadings of disposable wastes from 100% to 200% on the relatively short notice of an administrative decision. This increase in most cases would not affect the in-building handling materially; however, would likely overburden storage and/or disposal facilities.

With critical solid waste problems, such as these, facing architects and engineers, as well as developers and building management, needed acceleration of solutions in the design of systems for both buildings in the design stage and existing buildings is obvious. However, no single source of information offering concise data on total systems or equipment that is presently marketed is available as a guide to determining interim solutions.

Continuing Studies:

In the course of this continuing study, a review of recognized publications providing coverage on various aspects of solid waste management, as well as direct contact with manufacturers, was undertaken in an effort to assemble a cross section of the equipment that is readily available for consideration in the design of building systems. This information is incorporated in Volume III, which defines and catalogs equipment components and accessories by functions within the system, i.e. handling, storage, processing and disposal. This volume also covers selected equipment in developing and experimental stages that may prove to be adaptable to building systems at some future date.

This equipment research, together with the inventory and evaluation of existing solid waste systems in the local projects as contained herein, provides the necessary background for the continuing study on upgrading of these systems, which is presented in Volume IV.

The concluding volume of this study presents design requirements for solid waste system improvements in selected local projects, including preliminary plans, outline specifications, construction costs and benefits of the system.

This series of studies demonstrates the need for greater emphasis on solid waste management in buildings and the state of the art in equipment development, development of design criteria, as well as the potential of economic and environmental benefits that may result from an adequate system design.

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